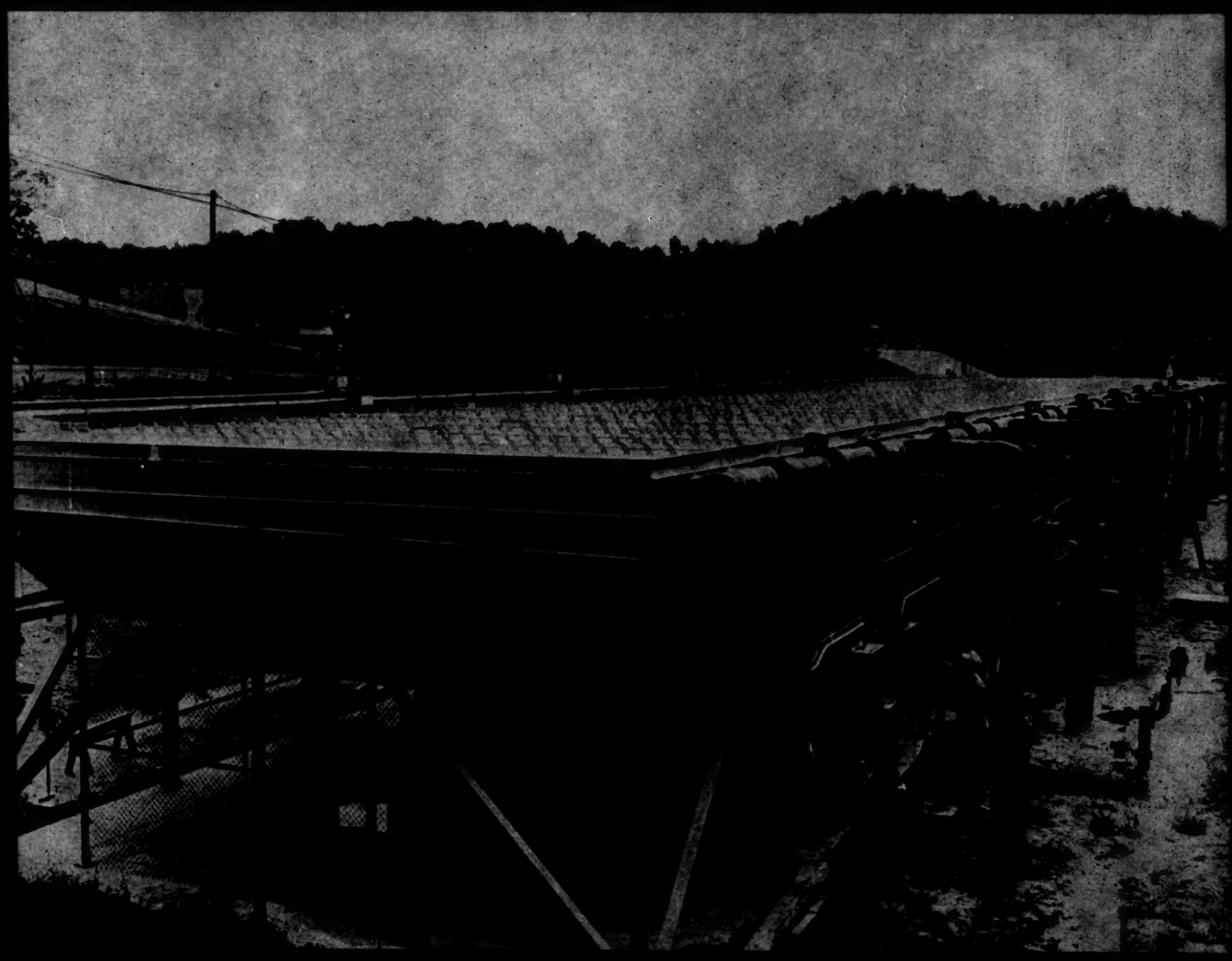
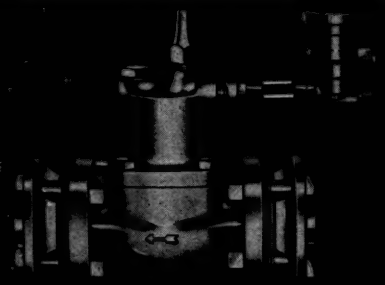
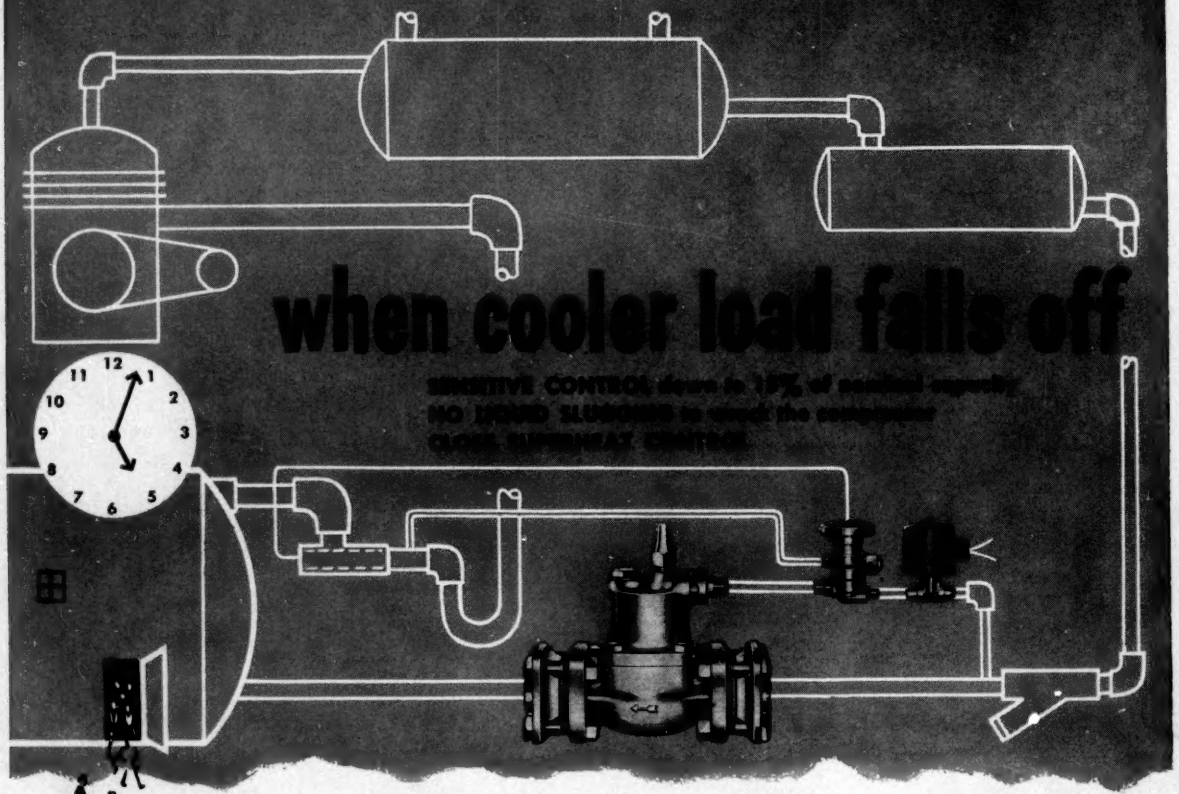
INDUSTRIAL REFRIGERATION





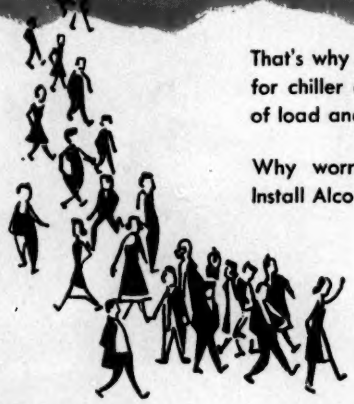
PO

maintains control



when cooler load falls off

SENSITIVE CONTROL down to 15% of nominal capacity
NO LIQUID SLUGGING to upset the compressor
CLOSE SUPERHEAT CONTROL



That's why Alco is recommended so often for chiller applications with wide ranges of load and capacity.

Why worry about compressor failure? Install Alco and relax!

Capacities: 20 to 200 tons, F-12 and F-22

Buy Alco . . .
The System Shows the Difference

Write for Bulletin No. 189-57

The one complete line of refrigerant controls that insures product quality: Thermostatic Expansion Valves, Refrigerant Distributors, Solenoid Valves, Suction Line Regulators, Flooded Evaporator Controls, and Reversing Valves.

SEE YOUR ALCO WHOLESALER

ALCO VALVE CO.

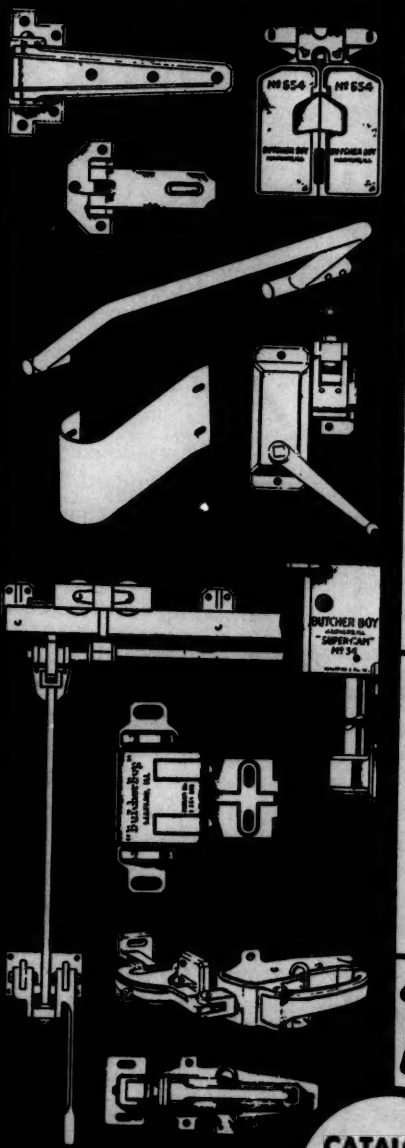
835 KINGSLAND AVE • ST LOUIS 5 MO

7600

"Butcher Boy"
Since 1885

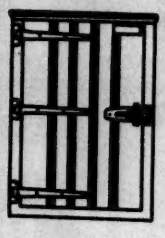
Refrigerator Doors

REFRIGERATOR DOOR
HARDWARE



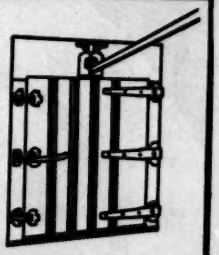
SAFETY RELEASE FASTENERS
No. 11 or No. 12

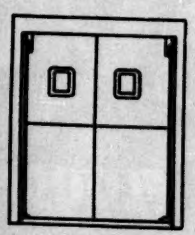
CATALOGS AVAILABLE UPON REQUEST



STANDARD COOLER-FREEZER DOORS

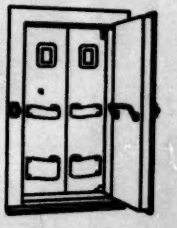
- Modern Streamlined Appearance
- 100% Douglas Fir Construction
- Massive and Durable Hardware





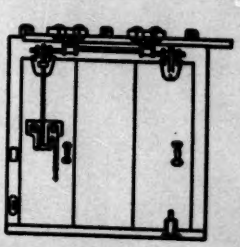
STANDARD VESTIBULE AND AUTO CLOSE DOORS

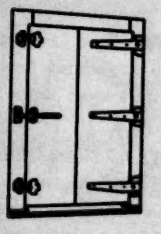
- Double Acting Doors for Loading Docks
- For Heavy Trucking Openings
- Save Refrigeration Losses



HORIZONTAL SLIDING DOORS

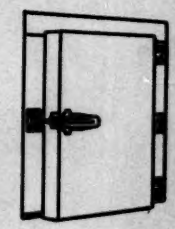
- Ideal where space factor is limited
- Recommended for Freezer Areas
- Available for manual, air, or electric operation
- Mechanically operated doors open and close in less than 4 seconds





LOW TEMPERATURE INFITTING AND SUPER FREEZER OVERLAP DOORS

- Low Temperature Doors for +10 to —20° F
- Super Freezer Doors for —0 to —100° F
- Both types available with No. 51 electric defrosters
- Extra heavy duty hardware applications



New!

FULLY AUTOMATIC ELECTRIC DEFROSTERS

- Underwriter's Approved—An exclusive First with Butcher Boy
- Flexible "silicon" covered (not lead covered) heater cables
- Furnished with calibrated "thermostat"—economical heat control

BUTCHER BOY REFRIGERATOR DOOR CO.

SPORLAN LEVEL MASTER CONTROL

LMC

is the

PEAK PERFORMANCE Answer *to all* FLOODED SYSTEMS

Here's why!

Because only the Sporlan Level-Master Control uses standard Sporlan thermostatic expansion valves with matching level-master elements. This perfect combination of LMC element and thermostatic expansion valve assures a positive liquid level control for Ammonia and Refrigerant 12 up to 100 Tons... Refrigerant 22, up to 180 Tons.

READ THESE LMC PEAK PERFORMANCE FEATURES CAREFULLY!

MODULATED FLOW. The Level-Master Control provides a modulated flow and maintains practically a static liquid level in the low side.

NO MOVING PARTS. The insert bulb controlling the liquid level has no moving parts. Control does not operate through use of a mechanical float device of any kind.

SIMPLIFIED AND ECONOMICAL INSTALLATION. The insert bulb can be placed directly in the shell, accumulator or liquid leg for direct contact with refrigerant. Existing float control systems can be easily and economically converted.

NOT AFFECTED BY TURBULENCE. Regardless of any agitation which might occur in the low side, the effect on the Level-Master is merely that of striking a mean level and holding that level constant.

TIGHT CLOSING. Tight closing is assured by the spring action in the thermostatic expansion valve during shut-down periods when the heater element is off and liquid refrigerant is in contact with the bulb. The Peak Performance of Sporlan Thermostatic Expansion Valves has been proven over a period of many years.

Only Sporlan Replaceable Core Catch-Alls designed especially for Ammonia use, can effectively remove scale and other foreign matter that ordinary strainers miss. Stop pitting or wire drawing of pins and seats in Solenoids and Thermostatic Expansion Valves, and excessive wear of compressor parts. Install a Sporlan Replaceable Core Catch-All in your Ammonia system now!

Write for Sporlan Bulletin 60-15 today. Also order the proper Catch-All for use with the Sporlan Level-Master Control and get Peak Performance on all your flooded jobs.

SPORLAN VALVE COMPANY

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Industrial Refrigeration

December, 1957

Now in its 66th Year of Publication

Number 6

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J. F. NICKERSON, Founder

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The Cover:

Heat energy in the nuclear power plant is absorbed by a coolant and then given up to the steam generators for useful work. In the research reactor, however, such heat cannot be converted in such quantity due to the nature of experimental processes. Therefore surplus heat must be transferred to another media.

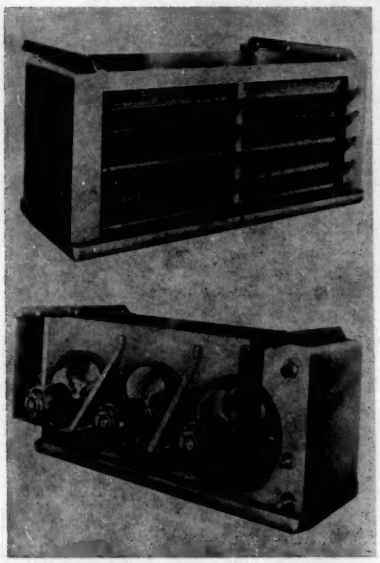
The 20 megawatt reactor at Oak Ridge National Laboratory produces up to 68 million Btu/hr in excess of laboratory requirements. Using 12,000 gpm the monster fluid cooler pictured, "refrigerates" cooling water coming from the reactor. Made up of eight giant-size aluminum coil sections, this Trane fluid cooler effects a heat flow from water to air by means of 16-ft. propeller fans in each section.

What's New

MACHINERY
APPLIANCES • PROCESSES

New 3-Fan Rapid Freeze Unit

DESIGNED especially for heavy duty low temperature service, the new Howe 3-fan rapid freeze unit cooler provides high tonnage capacity of up to 4½ tons. Coil has permanent 100 percent fin contact. Also permits use with ammonia,



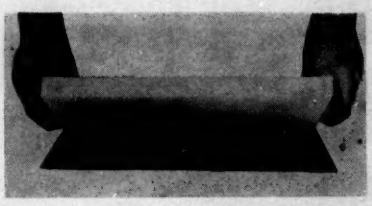
Freon and brine. Features automatic hot gas defrost with electric heated blanket that insures ice-free drain pan and quick warm-up when defrosting. Units are ceiling mounted for space-saving and uniform air circulation. Special headered circuits for maximum heat transfer, make these new Howe Units adaptable for blast freezing and freezer storage. Manufactured by the Howe Ice Machine Co., 2825 Montrose Ave., Chicago 18, Ill.

Trowelable Mastic Adhesive

A NEW high strength, quick grab, fast drying, trowelable mastic for bonding "Styrofoam", "Dylite", and similar rigid and semi-rigid plastic (styrene, urethane, isocyanate, etc.) foams to themselves and to other materials such as wood, metals, etc., has been announced by Rubber & Asbestos Corp., Bloomfield, New Jersey.

The new product, trade-named Bondmaster G458, incorporates a special solvent blend which has been formulated to minimize or eliminate cell collapse due to attack on the surface of the foamed styrene. It is available in black or in neutral cream color.

Constantly widening interest in the use of rigid sandwich panels with foamed styrene cores in heating, air conditioning, refrigeration, and similar applications influenced the development of this product, the manufacturer reports. The new adhesive resists humidity, resists freezing temperatures, and reportedly does not give or transmit objectionable odor or taste properties to foods stored in a refrigerator employing the new bonding agent.

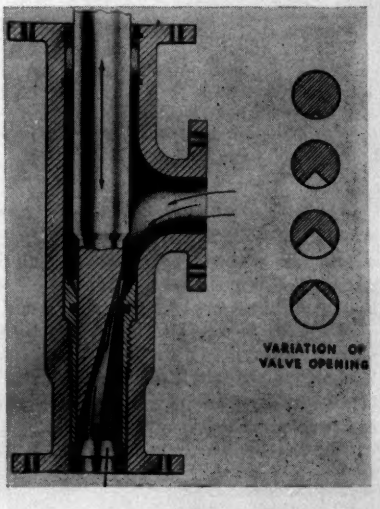


Parts to which the new adhesive has been applied may be mated almost at once (allowing a few minutes for solvent release). The mastic may be applied with a saw-tooth spreader, notched trowel, or spatula. Since the recommendation is for the application of as thin a coat as is practicable, it is reported that substantial cost savings can be effected with the reclaim rubber mastic as compared with previously available materials for this application.

Tapered Orifice Valve

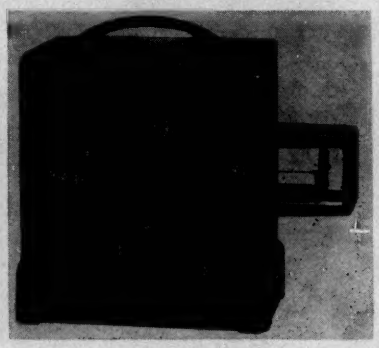
THE Tapered Orifice Valve (patents pending) offers a new concept of flow control. By moving a plug with a tapered slot into and out of a circular opening, the flow of fluid or gas is controlled by the area of the tapered slot at the head of the opening. A circular sealing ring eliminates by-pass. Replacing the needle valve in nearly all applications, the tapered orifice valve will pass foreign particles up to twenty times larger than comparable needle valves.

Its principle advantages according to the manufacturer are: highly accurate, infinitely variable control; non-clogging; non-freezing; abrasion-resistant; excellent coefficient of flow at all settings with very low turbulence. The valve is available in many sizes, pressure ranges and connections.



Instrument Graphs Humidity Changes

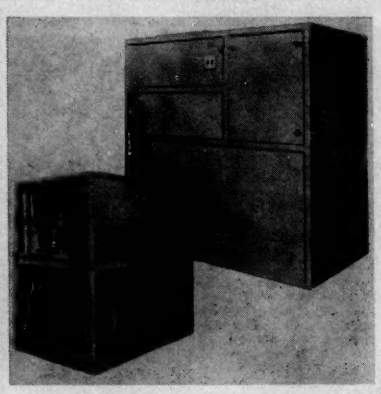
AN INSTRUMENT which makes possible the graphing of minute changes in ambient relative humidity is now available from Serdex, Inc., Boston, Mass.



This instrument is called a Microhygrograph. It utilizes the extremely sensitive Serdex Diaphragm (a specially designed animal membrane), and makes minute fluctuations in relative humidity visible by recording them on an outsize 12 by 6 inch chart.

Packaged Air Conditioner

A PRE-ENGINEERED central station air conditioning system, the 'CPU' manufactured by Dunham-Bush, Inc., West Hartford, Conn., is completely self-contained, housing an evaporator, compressor, evaporative condenser, fans, motors, refrigerant piping, and controls in an attractive grey enamel casing. All components are completely enclosed.



A summer-winter conditioner, the 'CPU' unit also functions as an evaporative condenser water saver. The assembly is available in five sizes: 10, 15, 20, 30 and 40 ton.

Based on its performance, it is the opinion of the manufacturer, that consulting engineers will find that the use of 'CPU' saves time in planning specifications, and space in job installation and contractors can install the unit with the least possible difficulty.

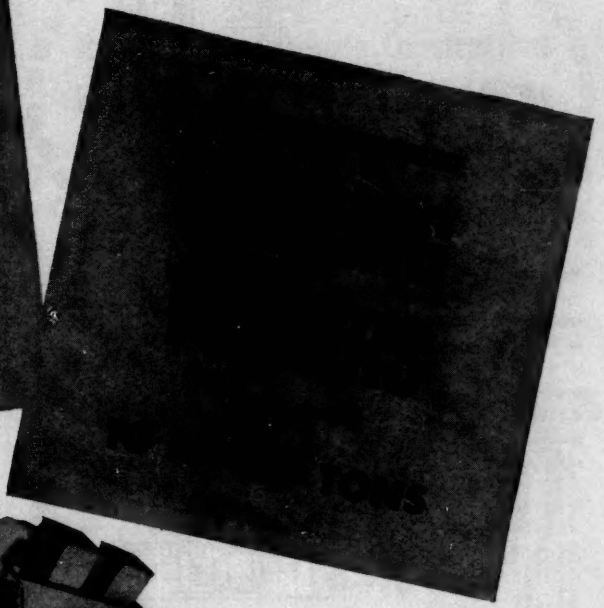
B.A.C.

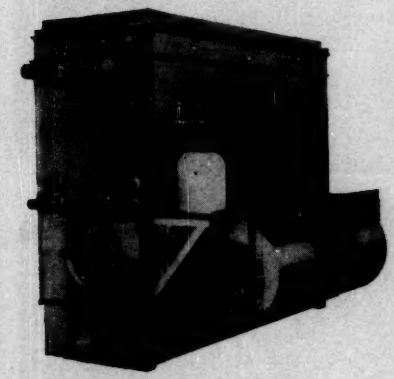
The most complete line of

EVAPORATIVE CONDENSERS

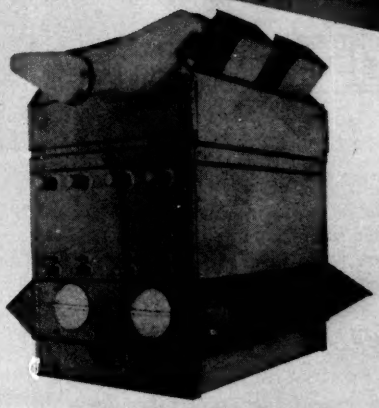
(Illustrated)

10 to 350 TONS

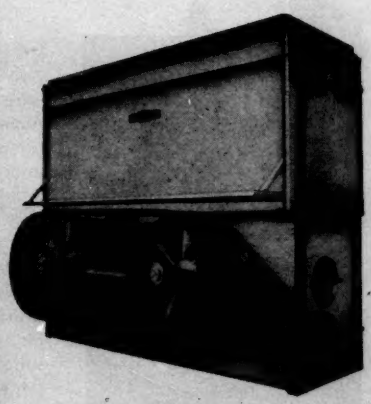




BLOW-THROUGH
Centrifugal Type



DRAW-THROUGH
Centrifugal Type



BLOW-THROUGH
Propeller Type

- All Hot-Dipped Galvanized Construction
- Quiet Operating (Centrifugal Fan Units)
- Low Horsepower (Propeller Fan Units)
- Condensers—Full Weight Steel Pipe Coils
- Towers—Non-Warping, Fireproof Galvanized Wet Deck Surface

ALSO: INDUSTRIAL TOWERS to 1200 GPM
For Critical Applications—Any Approach, Any Range

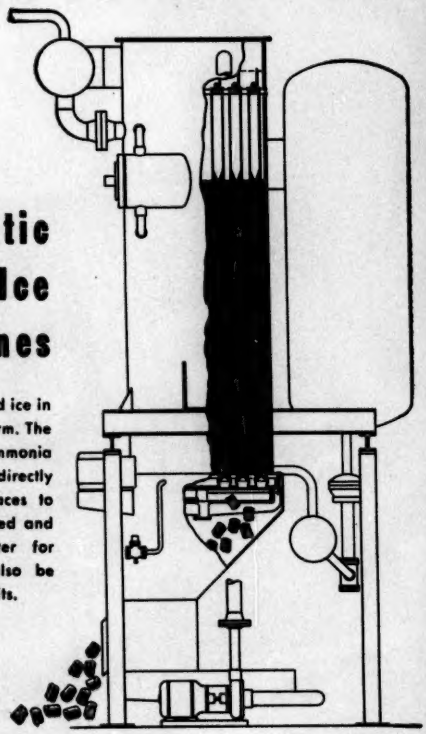
BALTIMORE AIRCOIL COMPANY, INC.

BOX 7322, BALTIMORE 27, MARYLAND

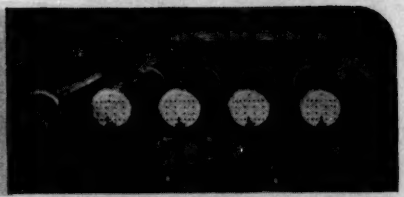
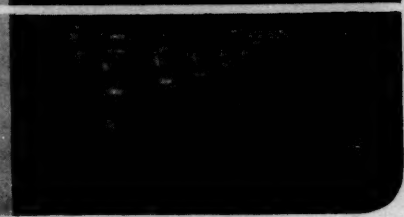
GET AHEAD with . . . "YEARS-AHEAD" . . .

Automatic Tube-Ice Machines

Make clear, hard, sized ice in cylinder or crushed form. The refrigerant, either Ammonia or Freon, is applied directly to the freezing surfaces to produce ice with speed and economy. Cold water for process work can also be supplied by these units.



ICE MAKING and REFRIGERATING EQUIPMENT

Refrigeration Condensers	Available in horizontal multipass shell and tube types and vertical single pass types for Ammonia or Freon refrigerants. Special metals, lined tubes, etc. can be furnished for unusual operating conditions.	
Brine Coolers	Multipass type brine coolers are ideal for closed brine systems in cold storage plants, dairies, packing plants, petroleum refineries, etc. requiring units of large capacity. Also suitable for cooling non-corrosive liquids in general.	
Scraped Surface Exchangers	Continuously revolving scrapers sweep heat transfer surfaces clean and keep solids in suspension. Useful in problems of heat transfer with crystallization with high viscosity, or with solvent extraction. Available in double pipe and shell and pipe construction.	

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SALES OFFICES: New York, Chicago, Cleveland, Dallas, Camden, N. J., St. Louis, Charleston, W. Va., Cincinnati

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Big Industrial Air Conditioning Market

A RECENT news report in the *New York Times,* following a survey among the large manufacturers of air conditioning equipment and components for industrial and commercial applications stated that these companies will do a business this year of a billion and one-half dollars, double the dollar value of residential air conditioning valued at $700,000,000.00.

According to the report "one of Carrier's big 1957 installations was for two compressors with a total rated cooling capacity of 15,382 tons at the Americas Building, New York City. This completed the company's air conditioning of Rockefeller Center Buildings at a total estimated price of $12,000,000.

"The York Corporation went through an extensive reorganization after being absorbed by Borg-Warner earlier in the year, according to Henry Haase, York president. Mr. Haase said that the present Borg-Warner subsidiary would achieve its biggest volume this year. He also predicted that York would increase its 1958 sales by more than 5 percent, the gain widely expected for the over-all industry next year.

"Outstanding 1957 installations by York this year were at the Conrad Hilton Hotel in Chicago; the Southdale Shopping Center in Minneapolis; the Tishman Building in Cleveland and the 2 Broadway Building, New York City.

"The Trane Company, which its competitors say 'came out of nowhere after World War II,' reports that its orders for industrial air conditioning equipment to go into factories in the first eight months of this year rose 233 percent above the like 1956 period. Last year, Trane's sales were $71,500,000. This year, according to Donald C. Minard, president, they should be higher.

"Trane provided 3,250 tons of air-conditioning equipment for a guided-missile plant of the Martin Company at Orlando, Fla., this year. Another installation at the new Skokie, Ill., factory of the Teletype Corp., a Western Electric subsidiary, used 2,500 tons of equipment."

Frozen Food Trade Seen Depressed

OVERPRODUCTION and the growth of buyers labels in the past year have contributed heavily to the present depressed state of the frozen foods market, Ralph O. Dulany, president of the J. H. Dulany Co., Fruitland, Maryland, leading packer of fruits and vegetables reported in a talk delivered at the first Fall luncheon session of the Eastern Frosted Foods Association, according to the New York Journal of Commerce.

Another speaker, R. P. Fletcher, Jr., president, Booth Fisheries, Chicago, called for more advertising and promotion by the frozen seafoods industry to boost per capita consumption and for mergers of smaller firms into large and strongly integrated operations in order to compete more successfully in the market. The meeting of the association featured a complete luncheon of the latest frozen foods products.

"Present low profits of many packers are traceable largely to two conditions which have happened simultaneously," Mr. Dulany reported to the audience of leaders in the industry.

"Number one was the widespread effect of the rapid growth of buyers labels and number two, was the disastrous overproduction of frozen fruits and vegetables in 1956.

SHANK
AMMONIA VALVES

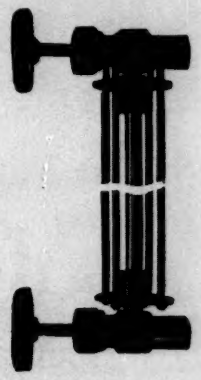
Rugged and Accurate Construction
For Long-Life and Dependability!

Largest Line of Ammonia All-Steel Cadmium Plated Bar Stock Valves in the Industry

IMMEDIATE DELIVERY
ON OUR COMPLETE LINE

ALL-STEEL GAUGE SETS

Automatically shut-off liquid in case of glass breakage.
For Ammonia, Freon and Methyl Chloride
All parts are rust-proofed by plating.
Valve stems are packed with composition packing rings which insure a long-life no-leak seal.

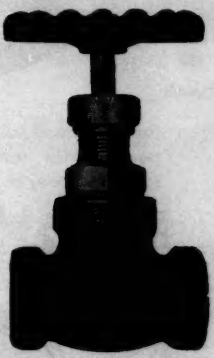


RELIEF VALVES

For Ammonia and Freon. Angle type, one-piece body with screwed ends and rust-proofed finish.
Positive relief action and reseating are assured by the design of the seat used. For ⅜", ½", ¾" and 1" pipe size.

SEMI-STEEL
SHUT-OFF VALVE

Made of highest grade, non-porous metal obtainable.
Double-seated stem is of rust-proofed steel. Valve ports are full size insuring maximum flow. Composition packing ring is impregnated with graphite for ease of operation and will not deteriorate in service.



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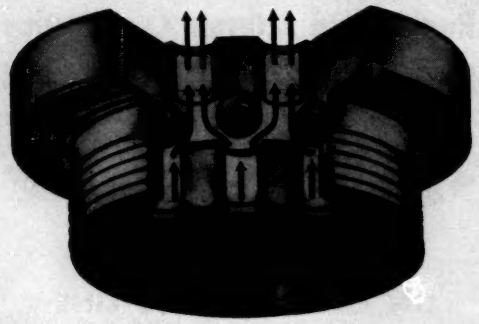

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Frozen Food Packers Start Survey To Ascertain Handling Practices

AT LEAST 3,000 retail grocery stores, and perhaps as many as 5,000 stores, will be checked this winter to determine how they are handling frozen foods. This is part of an over-all industry program sparked by the National Association of Frozen Food Packers to improve the quality of frozen foods delivered to consumers.

Every step in retail frozen food handling, including transportation to the stores, will be investigated, and reports will be sent to NAFFP headquarters here. Tabulation will be done by the packers' organization.

The decision to go ahead with the retail survey was made last month by an all-industry Task Force to Improve Frozen Food Handling and plans were finalized last week. This Task Force was established last spring on call from NAFFP, and includes representatives of packers, distributors, warehousers, retailers, rail and motor carriers, and the U. S. Department of Agriculture as reported in the November issue. Reason behind this movement was last year's report by USDA research scientists that a tremendous amount of frozen food is exposed to high temperatures in marketing channels with the result that inferior quality is delivered to customers at the stores. The packers believe that much customer dissatisfaction results from this mishandling, with resulting harm to sales.

An NAFFP spokesman emphasized that this survey does not imply that retailers alone are to blame for mishandling. "We are starting on this level because it is where frozen food is handed over to the customer, because it is an extremely vulnerable area, and because less factual information is available on these operations than others," he said.

Another factor is the interest shown by the Association of Food & Drug Officials of the U. S. in what goes on at the retail level. AFDOUS officials specifically asked for such a survey and NAFFP agreed to start it in motion. Actual store checks will be undertaken in large part by AFDOUS members, using special probe thermometers provided by NAFFP. They will begin early in December.

Object of Survey

NAFFP said there are two principal objectives of the retail survey. First, it will spotlight the trouble areas in the stores and permit the Task Force to determine where education is most needed at the retail level. Second, it will supply AFDOUS with the marketing information it wants. This latter is especially important, NAFFP pointed out, because of a developing trend in some parts of the country by food and drug officials to impose strict marketing controls on frozen foods. Because of NAFFP's cooperation in this survey, and in a companion survey of manufacturing practices at the plant level, AFDOUS has suggested to its members that further attempts at regulation be postponed until the facts are known. The plant survey began in mid-summer.

Both of these surveys will augment information already on hand in the industry concerning handling in warehouses and during transportation, although NAFFP concedes that further checks at these levels are probable in the future.

NAFFP expects to have a preliminary report of retail findings ready for the 1958 Convention of the National Association of Frozen Food Packers in Chicago in March.

Meanwhile, Task Force representatives are stepping up the pace of their respective educational programs and are establishing a communications system by which materials and ideas can be coordinated.

Irving R. Klein and Associates, architects

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"Styrofoam," continued Mr. Levit, "is completely effective in maintaining desired temperatures. Our cooler is kept at a constant 35°-37°, and the freezer room stays at minus ten to twelve degrees. We've had no variation in those ideal temperatures since opening our new plant."

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B	●			●			●	
C	●		●					

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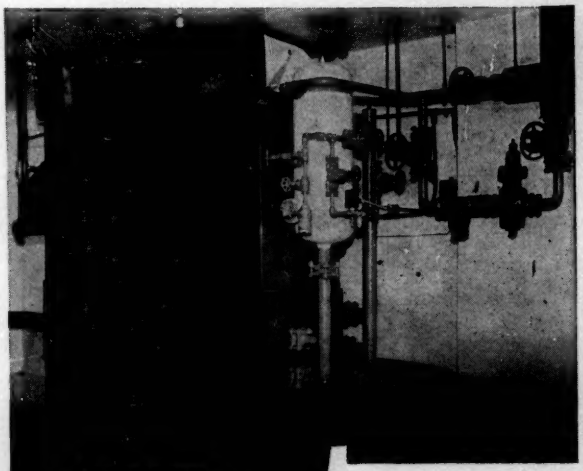
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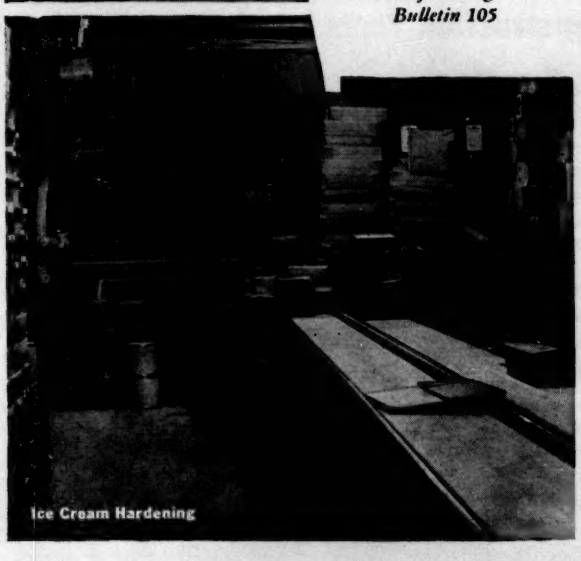
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Dehydrofrozen Peas Meet Acceptance Test

A NEW food product—dehydrofrozen peas—has met the test of acceptance in the restaurant trade and shows wide promise of expanding the market for peas.

According to market development specialists of the Agricultural Marketing Service, in a recent study among 100 restaurants in Milwaukee, Wis., the new product fared well in comparison with frozen and canned peas.

The research was conducted in cooperation with the Western Utilization Research and Development Division of the Agricultural Research Service, which developed the new product. As yet, the product is not widely available commercially.

To prepare dehydrofrozen peas, processors remove about two-thirds of the water content from fresh peas and then quick-freeze them. This process reduces the fresh weight about 50 percent. Direct results of this reduction in both volume and weight are substantial savings in freezing, packaging, transportation, storage, and other handling and distribution costs.

Restaurant operators found that dehydrofrozen peas compare favorably with frozen peas in ease of preparation and cooking. More than half of them considered the new product as easy to prepare as canned peas.

The appearance of the new peas after cooking was better than regular frozen peas, according to the operators, who also said the test product was greener and firmer. A majority of them expressed the opinion that dehydrofrozen peas are unsurpassed in keeping their freshness, flavor, and good appearance even after considerable periods of time on the steam table.

Gas vs Cold Storage For Apples

GAS storage of apples can give them a longer life and maintain a better quality than the conventional method of cool storage according to a claim made by two agricultural scientists, R. N. Robertson and D. Martin, writing in the Journal of the Australian Institute of Agricultural Science. They claim that it has been shown that a system of gas storage widely used in England will increase the storage life of several varieties of apples by approximately half as much again as in cool storage.

Experiments have shown that several varieties of Australian apples are satisfactory under gas storage. In Granny Smith apples, as an example, the undesirable yellowing has been delayed and the crisp texture, with good flavor, has been maintained until Christmas.

"It seems probable that gas storage of the better dessert varieties will lengthen their storage life and maintain their quality so that varieties like Democrat, which have long storage life but poor quality, may be eliminated," the writers say.

"Now that disorders of storage are largely controlled or eliminated and fruit of good appearance can be stored for the whole period between the fresh fruit seasons, more attention should be paid to the improvement of quality in stored apples. Frequently, because the appearance of stored fruits is so good, varieties like Jonathan are being marketed after the period when their quality, judged by flavor and texture, has declined.

"Since apples are bought on appearance rather than on knowledge of eating quality, there has been no marked consumer resistance to this tendency. It seems necessary, therefore, to carry out some more experiments to define the limits of cool storage and gas storage when judged by satisfactory eating quality".

In the Spotlight

FROZEN FOODS, despite their great commercial success, face a constant danger in exposure to high temperature. To show that temperature damage can and does take its toll, the Time-Temperature-Tolerance Project in the Western Research Laboratory USDA in Albany, Calif., has developed specific information on safe temperature for holding different frozen food products. Improved protection as cited in the article on page 19 will mean more excellent quality delivered from farms and freezing plants to consumers.

REFRIGERATED Warehouses have anticipated the requirements of the growing frozen foods industry and have geared their operations in terms of customer needs and distribution, not just storage. Warehousing is a specialized business as Sheffield A. Kadane, NARW points out to the frozen food industry in the article on page 21.

FREEZING has been an important factor in the growth of the poultry industry, according to Clifford Carpenter, president of the Institute of American Poultry Industries. His talk on the impact of frozen foods on the poultry industry at annual meeting of the Frozen Food Distributors Association is summarized in the article on page 22.

PROBABLY the first refrigerated warehouse to provide facilities for research in the irradiation of food products has been established in LaHabra, Calif. The process under study will involve radiation from a resonant transformer and also a Cobalt 60 source. Officials of the company believe radiated foods are a reality and commercially feasible for many food items and only await approval of the Food and Drug Administration which may be within the next two or three years.

INDUSTRIAL air conditioning equipment and components will account for an expenditure of approximately a billion and one half dollars this year, practically double the dollar value of residential air conditioning valued at 700 million dollars. Saturation point for this equipment application according to reports is far in the future with less than five percent of the market barely scratched.

THE REFRIGERATION equipment industry moved temporarily to Chicago during November when 15,000 visitors inspected the largest array of refrigeration equipment ever assembled under one roof. The show sponsored by the Air Conditioning and Refrigeration Institute displayed the products of 225 manufacturers exhibiting the latest designs in equipment and components. Eight national refrigeration organizations held meetings concurrently with the exhibit. Many exhibits displayed all year environmental conditioning equipment.

CLOSE CONTROL tolerance of temperature, moisture and air supply are made possible in the modern malting plant of the Albert Schwill Co. with 600 tons of refrigeration equipment. An electronic nerve control center, not only indicate, but in many cases record, exact process conditions and regulate variables involved. The operator merely turns selective switches or pushes buttons to initiate each phase or manipulates keys for checking and recording the exact condition. The picture story is on page 13.

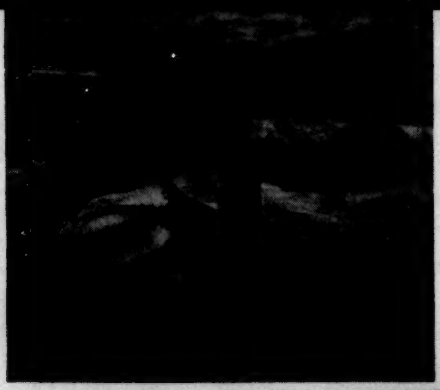
IRRADIATION of foods, an eight million dollar program is being launched by the U. S. Army at Sharpe General Depot in California. The program includes construction of a nuclear reactor and a food processing plant with an eventual capacity of 1000 tons of perishable food a month. One of the aims of this project will be to determine the cost of preserving food by irradiation.

MORE ICE for consumer and commercial purposes is probably being manufactured today than at any time in the nation's history — but not by the ice manufacturing plant. "On the premise ice machines" are the reason for this increased tonnage and manufacturers meeting in the 40th annual meeting of the National Association of Ice Industries discussed plans as how to get more of the profitable business. The industry is confident that national promotion of ice vending is the answer. See page 24.

A FREEZING process for converting salt water to fresh, now under study at Carrier Corporation, was described by C. M. Ashley and C. M. Bosworth at the Saline Water Conversion Symposium in Washington, D. C., November 4 to 6.

The meeting heard reports on various salt-removing methods under development to help solve the fresh water supply problem, which is a source of growing concern in many parts of this country and the world. It is sponsored by the Office of Saline Water of the U. S. Interior Department and by the National Research Council.

Mr. Ashley, chief staff engineer of Carrier's Research and Development Division, and Mr. Bosworth, senior research engineer, described the work on the freezing technique, which is being conducted under a contract from the Interior Department. The project covers both creation of a suitable process and evaluation of its economic feasibility.



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Magic In The Malt House

Five dual purpose germinating-kilning compartments in the new Albert Schwill & Company malt house are operated by this electronic nerve center. Instruments on this board not only indicate, and in many cases record, the exact process conditions, but they also regulate the variables involved. The operator merely turns selective switches or pushes buttons to initiate each phase, or manipulates keys for checking and recording the exact condition.

Quality Control No Sleight-of-Hand—It's Due To Refrigeration

MALT is used in brewing for the saccharification of cereal starches. High carbohydrate and protein contents make malt a valuable nutrient. This grain (usually barley) is steeped in water, partially germinated, then dried and cured. Enzymatic reactions are produced by the germination.

Germination of grain requires most suitable conditions of temperature, moisture and oxygen supply. For generations this process has involved tall buildings covering considerable acreage. Huge volume was required due to vast air spaces over germinating areas. Large air volumes provided the maltster with better control over temperature and humidity, when not favored by suitable weather conditions.

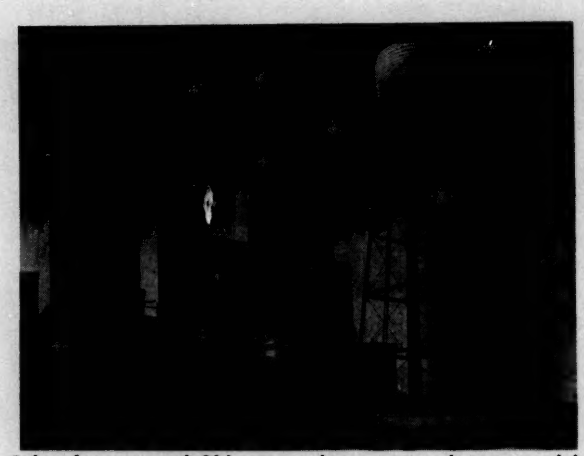
Additional building structures were required for kilning operations. The same was true of steeping, the initial step. Like many materials handling operations, in the malting plant grain was lifted to desirable levels and then allowed to flow by gravity to subsequent process levels. This also contributed to the vastness of buildings involved.

Albert Schwill & Company has devised a method for exercising improved quality control over the malting process while at the same time reducing the size of building structures to what they term a "ranch style" building. A utility important to this improvement is refrigeration.

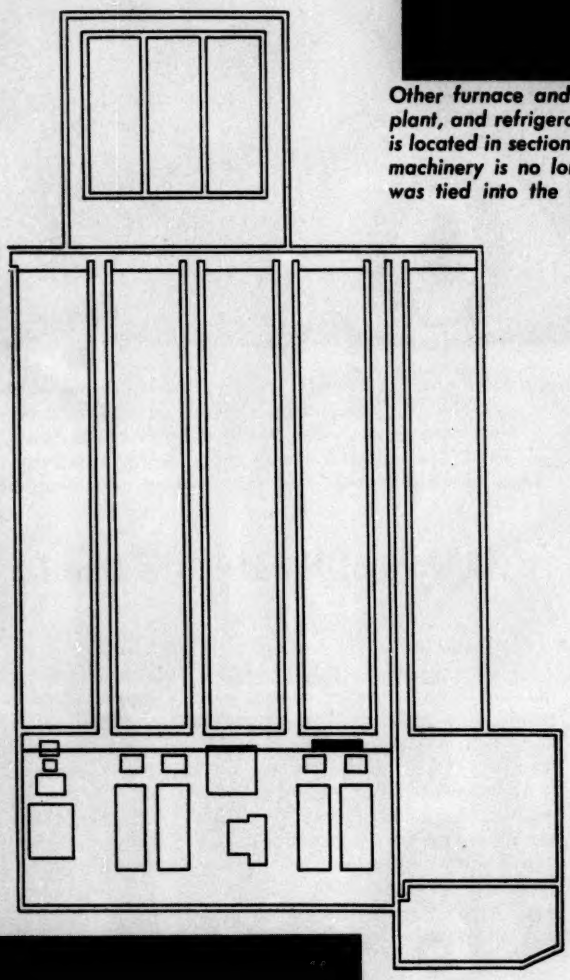
Quality production of malt is not left entirely to the automatic plant. Grain samples are analyzed at the very outset to determine exact procedure which the automatic plant will follow. Each step along the process route is checked by this modern laboratory which is in itself air-conditioned to insure testing accuracy.

Grain and malt silos dwarf the plant offices and laboratory building where November visitors from the ASRE and NAPRE conventions were first received at the Chicago plant of Albert Schwill & Company.

An 11-bushel pilot plant constructed and operated in the company laboratory, proved engineering theories of Company officers prior to construction of the new malt house. From the experiment such successful results were derived that a production scale model was planned. At right, on the roof of this one-story brick structure is an 80-ton evaporative condenser for the NH_3 refrigerating system. The production model became No. 1 germinating-kilning department of the new malting plant pictured in the center illustration. Machinery room at the base of the plan contains the air washers for four compartments and one of the two furnaces which supply heated air for kilning operations.



Other furnace and fifth air washer are in adjacent model plant, and refrigeration machinery for the production model is located in section at extreme lower right. This refrigeration machinery is no longer in operation since the model plant was tied into the new plant refrigeration system for simplicity of operation.



Three compartments in the top section of the plan view at left, represent the three steeping tanks in the new malt plant. Located below them on the plan are the four germinating-kilning compartments constructed following successful application of the adjacent production model.

Kilning furnace, four air washers, fans and distribution ducts are represented by rectangles shown in the equipment room. The modified "T" figure represents the 600-ton centrifugal compressor — condenser — water chilling unit.

The control panel pictured on the title page, is located on a platform above the machinery room floor and is represented by the heavy black rectangle.

Credit: In the preparation of this article, *Industrial Refrigeration* acknowledges with thanks the advice and assistance of T. P. Nelligan, executive vice-president, Lloyd E. Forsell, plant manager, Ray Burke, plant engineer, all of Albert Schwill & Company. Photographs by Torkel Korling were loaned to *Industrial Refrigeration* by Albert Schwill & Company.

At left is pictured the exterior of the new malt plant. The black rectangular structures reaching skyward are combination insulated air ducts and automatic pressure vents. Since the germinating-kilning compartments are under several inches pressure at operating conditions, they are equipped with automatic air reliefs. An exhaust damper closure or ventilation failure during the germinating process could conceivably lift entire roof if vents were not provided.

At lower right of the photograph is pictured the cooling tower for the new 600-ton Refrigerant-11 plant. Louvres in the masonry wall conceal machinery room exhaust fan.

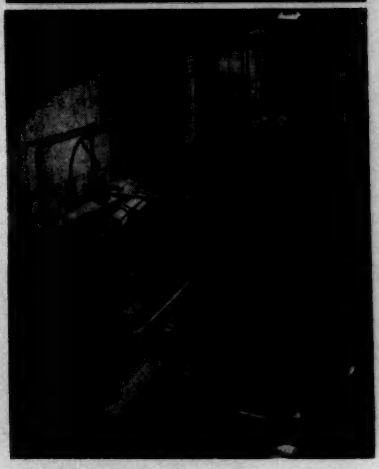
First step in the barley to malt process is the steeping operation. The new steep house of Albert Schwill & Company is not only unique to most brewers and malters, but is as efficient as well. Pictured left are the three big steeping tanks each capable of holding sufficient grain for one germinating-kilning compartment. Piping provides the conveyor, and water the vehicle, for conveying grain from the elevators to the steeping tanks.

Pictured at left are the conicle separators, three above each steep tank, which separate excess water from the grain being deposited in each tank. Steep tanks are topped with water during the operation. Stainless steel scuppers located inside the tile brim perform a skimming operation in four directions.

Right: High pressure jets move grain from sides of the tank. The central pipe supplies water for filling and over-flowing.

In the photograph at right, the grain is being removed through a steep-out hole located at the lowest point of the tank. The high pressure water jets provide a vehicle of considerable cushion to carry out the steeped grain. Air is also introduced through this center water line for process aeration.

At left: A steeping tank ready for emptying has been drained and is emptied by ""hydraulic conveyor".



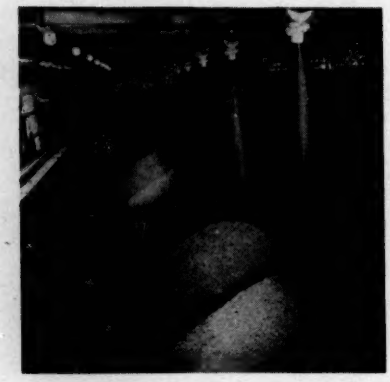
Piping, electro-pneumatic control valves and a transfer pump are used to transfer barley, carried in water, to and from the steeping tanks and to the germinating compartments. The pump room is pictured at right. Control of barley transfer operations is accomplished by means of a graphic control board located in the steep house (see next page for close-up). The operator can transfer barley from the grain supply to the various tanks, from one tank to another and from any tank to any germinating compartment by merely turning a switch. Extensive interlocking systems prevent errors in the operation of the system should the operator accidentally turn any switch out of proper sequence.

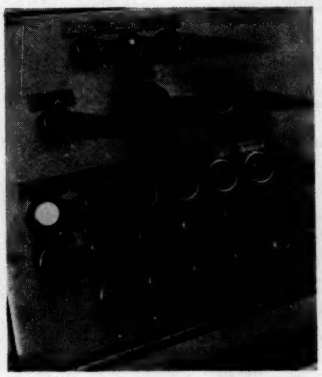
Left: Graphic control panel for regulating flow of grain from storage through steeping to germinating. Indicator lights show the equipment in operation and the route traveled.

Below, at left: Steeped grain is transferred to a germinating-kilning compartment and distributed equally over floor.

Next below: During germination a turning machine mounted on a crane travels back and forth through each compartment. Only the helices of the turning machine touch the grain, and stainless steel compartment linings and tile walls provide ultimate sanitary conditions.

Rooms are insulated from one another, allowing adjacent compartments to vary widely from one another in various process stages; one compartment will be cool while its neighbor is under-going higher kilning temperatures. Vapor seals are important, as humidity is often at 100 percent.





Tailor-made environment is an absolute requirement to successful production of quality malt by means of the new combination type plant. Above, the control panel for a typical compartment. The maltster can select an operation in proper sequence, which process is indicated by lights at the top of the panel. Indicated in this view, the operator has selected the germination process (top center bulb glows) and has turned on his control circuit (white light, lower left).

Next step would be to start large supply fans, such as pictured above, moving air to a combination combustion plenum and air washer for each compartment. Depending on weather conditions and the stage of process, some air can be recirculated, more fresh air admitted and the air heated or cooled as required. While the supply fan purges the chamber, the air washer pump is started. Once the pump is started, automatic controls determine whether or not more or less cooling and air washing is used. Next, the combustion blower is started, the gas pilot made operative, and the main gas burner started.

In the center photo at right, is a view of one of the combination cooling-heating plenums. The combustion blower, pilot and regulating valve are located on floor adjacent. Pump in the immediate foreground circulates condensing water from the cooling tower to the refrigeration unit.

Next right is pictured the 600-ton Refrigerant-11, 3-stage centrifugal water chilling unit. Control devices, purge cabinet and recorder-controller are pictured on the left side of the unit. At left in the photo is a chilled water circulating unit for the air washer pictured in the photograph at left.

Kilning is the final process performed on the barley malt before it leaves the compartments. Large quantities of heated air are required for this process. It is supplied by two furnaces. Furnace No. 2 is pictured at left in the illustrations above. Pump in that photo supplies chilled water to an air washer. View of the furnace from the supply fan end is shown in the view at right, above. Note damper controls.

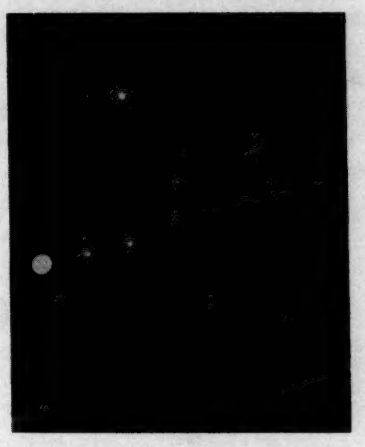
Refrigeration takes the variable weather factor out of malting.

Materials handling is perhaps the biggest single service which makes possible the one-story malt house developed by Albert Schwill & Company. However, heat and cold properly controlled actually initiate, retard or speed up and complete the germinating-kilning operation so vital to quality malt product. Refrigeration, therefore, is a vital factor to the very fine regulation of the germinating process in the modern malt house.

However, control over temperature, moisture and air supply, could not be achieved with the fine degree of control successfully applied in the Schwill plant, without a certain amount of instrumentation. One hundred-ton batches are germinated with only a plus or minus one degree F variation throughout the entire lot. During kilning the variation can reach plus or minus one-and-one-half degrees F, from that set on the autonatic controllers. Conditions vary from 50 F and 100% RH at germination low, to 200 F and near 0% RH at kilning high.

All components of the panel board and control console (see title page photo) are plug-in types. Instrument failures are quickly remedied by swapping a spare for the suspect unit. Plant engineers therefore are not only experienced combustion, air handling and refrigeration personnel, but competent pneumatic and electronic maintenance technicians as well.

Right, close-up of the controls for Furnace No. 2. These controls are located at either end of the main control console. Furnaces are hooked up in such a manner that they can be used on any or several compartments. In the close-up it will be noted that the operator has selected Comp'tm't No. 2 2nd light, top). Pre-determined temperatures have been set on the controller and his starting of the equipment shown merely initiates each step.



The controllers mounted on the panel board above the console, take over once the equipment is started by the operator. In this instance the operator energized his control circuit (bright indicator at left), and started his supply fan. When synchronous motor fan drive was up to speed, his board showed that by indicating the dc field applied (next two lighted bulbs).

Following completion of the germinating and kilning process in each compartment a gigantic gate is raised as shown in the photo below (center) and the malt spills to a conveyor which moves it to storage silos. At right below, is a close-up of the control panel for conveyor gate and floor of the malting compartment. The operator can start his conveyor and his hydraulic pump, then raise the gate for spilling the completely processed lot. The floor which is a gigantic conveyor moves under the operator's control toward the gate. As each section of the floor reaches the gate it spills its load of grain and turns under. When the compartment is emptied the floor can be reversed.

Panel also indicates pilots were properly lighted and main burner valves lighted and placed in operaiton. Like the combination air heater and washer plenum, indicators show that the combination chamber has been purged before the pilots or the burners became operable. Selective switch provides heated fresh air at prescribed conditions to Compartment No. 2. Other position would recirculate air from the kilns.

Refrigeration and Air Conditioning Equipment Manufacture Shows Big Increase for 1956

ACCORDING to the annual report issued by the Machinery and Equipment Branch of the Bureau of Census, shipments of packaged air conditioning equipment in 1956 totaled $494 million. Shipments of room air conditioners amounted to 1,828 thousand units valued at $291 million in 1956 compared with the 1,283 thousand units valued at $210 million, shipped in 1955. Shipments of remote condenser-type air conditioning units (split-systems) in 1956, totaled 95 thousand units valued at $59 million, compared with the 38 thousand units valued at $23 million shipped in 1955.

Among the components and accessories collected in this survey, shipments of condensing units in 1956 totaled 620 thousand units, valued at $82 million compared to 589 thousand units valued at $71 million shipped the previous year. A total of 3,781 thousand compressors and compressor units valued at $166 million, were shipped during 1956. Shipments of centrifugal refrigeration systems increased from 818 units in 1955 to 921 units in 1956.

The table presents a summary of the quantity and value of shipments of air conditioning and refrigeration equipment by class of product for the year 1955 and 1956.

The figures on quantity and value of shipments in this report represent completed sales of equipment, i.e., units actually billed and shipped. Complete units delivered on consignment or shipped to a branch warehouse for stock are not included until such time as they are actually sold. The dollar values shown are the manufacturers' net billing prices, f.o.b. factory.

AIR-CONDITIONING EQUIPMENT AND COMPONENTS FOR AIR-CONDITIONING AND REFRIGERATION EQUIPMENT: QUANTITY AND VALUE OF SHIPMENTS BY CLASS OF PRODUCT, 1956 AND 1955

Class of product	1956 Number of units	1956 Value ($1,000)	1955* Number of units	1955* Value ($1,000)
Condensing units (except for household refrigerators), total	619,922	82,290	589,335	71,067
Refrigerants (except ammonia), total	619,864	82,170	589,251	70,913
Air-cooled	550,301	55,146	523,200	46,050
Water-cooled	69,563	27,024	66,051	24,863
Ammonia refrigerants	58	120	84	154
Compressors and compressor units (except for household refrigerators), total	3,780,931	166,220	2,554,031	116,917
Refrigerants (except ammonia)	3,778,823	160,753	2,551,442	109,913
Ammonia refrigerants	2,108	5,467	2,589	7,004
Heat transfer equipment, total	xxx	146,486	xxx	114,064
Evaporative condensers	5,712	10,203	5,883	9,597
Air-conditioning units not self-contained	173,345	43,010	126,087	30,361
Unit coolers, refrigeration	96,754	16,292	97,034	15,053
Other heat transfer equipment	xxx	76,981	xxx	59,053
Packaged air-conditioning equipment, total	xxx	494,028	xxx	369,862
Room-air-conditioners, total	1,828,047	291,445	1,283,234	209,961
Window-sill type	1,818,908	289,017	1,268,161	206,172
Other than window-sill type	9,139	2,428	15,073	3,789
Self-contained air-conditioners (except units intended for residences and except window-sill type)	86,378	98,928	81,880	87,953
Year round air-conditioners, self-contained	18,390	16,890	21,621	21,378
Residential-type, self-contained air-conditioners, except room air-conditioners (without furnace) 2 tons and over	50,109	22,471	35,815	17,978
Refrigeration chassis for air-conditioning (without fan section and furnace)	10,529	5,700	19,664	9,155
Air-conditioning units, remote condenser-type (split systems)	95,200	58,594	37,881	23,437
Other air-conditioning and refrigeration equipment, total	xxx	115,200	xxx	93,312
Centrifugal refrigeration systems	921	29,105	818	25,732
Absorption and adsorption systems and equipment	1,842	9,245	1,738	5,023
Ice making machines	31,416	18,112	31,521	16,369
Packaged liquid chillers	4,215	12,754	2,392	7,534
Mechanical dehumidifiers, refrigerated type, self-contained	148,147	9,358	76,009	5,089
Mechanical drinking water coolers	137,012	19,427	128,304	18,688
Factory assembled water cooling towers	44,548	17,199	41,091	14,877

* Revised.
xxx Not applicable.

Open Wooden Pallets Rated Most Serious Fire Hazard

REPORTING in the July Quarterly of the National Fire Protection, M. H. Nickerson, assistant director of Factory Mutual Laboratories, said modern storage in material handling techniques have brought about a serious fire protection problem. According to Nickerson, the chief culprit was the open wooden pallet most commonly used as the basic storage subdivision in the modern warehouse.

Stacking of idle pallets in compact piles of considerable height provided the best opportunity for rapid combustion and a fire of highest intensity. Idle pallet storage provided three important factors for the rapid combustion and intensity.

General parallel combustible surfaces of the pallet are stacked so closely that the combustion rate from stack to stack is accelerated. Pallets are also stacked in such a manner that there is ample access of fresh air for combustion. Further they are stacked in such a manner that the majority of pallets in the stack are shielded from the sprinkler discharge.

Safety Standards, Vol. 6, No. 6, for November-December 1957 published by U. S. Department of Labor featured a report on Nickerson's paper. The article no doubt has summarized the laboratory director's work. It published 4 sketches and one photograph of a typical test fire run by the laboratories.

Firestopped pallet designs were urged by Nickerson. Three of the four sketches in the Labor Department paper showed firestopped wood pallets. The Labor Department publication noted that the Factory Mutual Engineering Division has discussed the results of their testing program with the National Wood Pallets Manufacturers Association. The manufacturers group quickly recognized the significance of the tests and is taking steps to work out an improved pallet design.

Association to Promote Frozen Potato Products

AN association of processors of frozen potato products, representing it is said, ninety percent of manufacturers engaged in the business in the United States has been formed for the purpose of increasing consumer acceptance of the product.

The association, yet unnamed, has chosen Leon Jones of the J. R. Simplot Co., Caldwell, Idaho as chairman of the organizing committee.

Protecting Frozen Foods From Temperature Damage

DESPITE the great commercial success of frozen foods, they face a constant danger—as well as a great opportunity. That danger is exposure to high temperature. The opportunity is preservation of a still greater portion of their original quality by rigid avoidance of all temperature damage. To convince the many thousands who handle frozen foods that temperature damage can and does take its toll, here are facts on kinds of quality loss—and their rates at various temperatures—from the Time-Temperature-Tolerance Project in USDA's Western Regional Regional Research Laboratory in Albany, California.

INDUSTRIES who make, transport, store, or sell frozen foods try constantly to avoid temperature damage. This undertaking is a complex, difficult, nationwide effort that involves all the steps in handling—as well as equipment and management.

Several years ago, industrial leaders proposed research that would involve collection of samples from packers in major producing areas during several seasons. It involved testing for losses of quality at various temperatures during various periods, representing mild to severe conditions known to be causing inestimable losses.

The Western Utilization Research and Development Division of the U. S. Department of Agriculture's Agricultural Research Service undertook the project and now, after construction of special facilities and several years of work on samples, is presenting results to all who are interested.

50,000 Samples

Project workers have collected over 50,000 samples from commercial plants in major producing areas and their work on fruits and on concentrated orange juice is complete. Studies on vegetables, poultry products, and prepared foods are well along.

Practical information is available and as much as possible is summarized in this report. Emphasis is placed here on needs of those who ship, store, sell, and deliver frozen foods. Technical reports are valuable especially to those engaged in the development of equipment and packaging and in the technology of frozen-food manufacture.

Practical information includes more than the simple fact that zero is a safe temperature and must be consistently held if original quality is to be protected. Better frozen-food handling requires proof that damage is developing even though it is not easily apparent. Practical knowledge includes factors in quality, kinds of damage, and rates of each kind under various temperature conditions.

Quality is Complex

The frozen-food industries have established high standards and new concepts of quality, which are important in merchandising. They are basic reasons for consumers' purchases—the real reasons for the success of frozen foods.

Quality is complex. It includes color, flavor, texture, attractive appearance, nutritive values. In the Time-Temperature-Tolerance Project and other frozen-food research, chemical analyses are used for vitamins and other compounds, light-measuring colorimeters and spectrophotometers for color, force-measuring instruments for tenderness, trained human tasters for flavor and appearance. Such methods supply reliable measurements.

A familiar and useful example of quality and its decline is supplied by fresh foods, and freshly prepared foods. They age quickly in ordinary surroundings, lose color, flavor, texture, nutritive values, even before they spoil from action of bacteria and molds. This loss of prime quality can be simply described as aging. Essentially the same changes occur in frozen foods if temperature is not low enough.

Erroneous assumption No. 1 *is this*: That a cold and hard package of frozen food is adequately protected against loss of prime quality. All the chemical reactions that result in loss of quality accelerate as temperatures rise from 0 F or lower level. At 15 F these changes occur several times as fast as at 0 F, and at 25 F to 30 F several times as fast as at 15 F. Coldness and hardness do not assure protection.

Erroneous assumption No. 2 *is this*: That lowering temperature down to zero or lower corrects temperature damage. As temperature of frozen foods rises or falls, losses of top quality move fast or slowly. They never move in reverse. No one can make old foods young again.

Erroneous assumption No. 3 *is this*: That temperature damage is not retained over long periods. Even slight changes in color, flavor, or other quality factors early in the commercial life of a frozen food remain regardless of excellent handling later.

IMPORTANT GENERAL FACTS: Decline from topmost quality proceeds by numerous processes whose initial stages are not detectable on casual examination. These changes are barely active at zero or lower but as temperature rises these rates increase rapidly — *doubling* several times in the range up to 25°F. Severe damage results from accumulations of mild damage, as well as from single severe exposures.

Temperature Damage In Frozen Foods

Frozen fruits are damaged in several ways, and certain types of damage becomes conspicuous early. Changes in color and appearance are important and easily detected. Less easily detected changes also occur at the same time.

Examples are dark-brown peach slides, discolored strawberries, raspberries with color bled into the sirup, dull-brown cherries with toughened skins. Quality changes may begin even before freezing and develop a little at a time with minor mishandlings—or they may occur with brief severe exposure.

This information was prepared for distribution at the Convention of National Frozen Food Distributors Association, Chicago, Sept. 8-11, 1957. For further information write Western Regional Research Laboratory, Albany 10, California, headquarters of the Western Utilization Research and Development Division, Agricultural Research Service, U.S. Department of Agriculture.

Peaches Damage Easily

Of four retail-packed fruits investigated comprehensively, frozen peaches are most quickly and conspicuously damaged. Brown slices can cause consumer complaint, and they may become apparent after total exposures of 24 hours or less time at 30 F, 100 to 150 hours at 20 F, 60 days at 10 F, or two years or longer at 0 F.

Strawberries undergo flavor changes that become easily detectable within totals of 24 to 48 hours at 30 F, 6 to 12 days at 20 F, or about three months at 10 F—but will lose little top quality in well over a year at steady 0 F. The discoloration and loss of vitamin C develop simultaneously. Flavor change is early evidence of quality loss.

Frozen raspberries reveal temperature damage less quickly than other fruits but tend to lose color from berries to sirup at fairly rapid rates. This change is not accompanied by drastic change in flavor but definitely indicates that the product is losing its fresh condition. Zero or lower supplies protection.

Fruits contain important amounts of vitamin C (ascorbic acid). Top-quality strawberries contain more than orange juice. Frozen peaches are frequently packed with added ascorbic acid to retard browning. Temperature abuse causes loss of this vitamin, and rate of loss is related to rates of other losses of quality factors.

The project has shown that cooperative industrial efforts to avoid temperature damage can be aided by the test for ascorbic acid in strawberries. Analyses measure not only vitamin remaining but also the chemical products of its destruction; therefore the original and the lost percentages can be estimated. For raspberries, flow of color from berries to sirup reveals temperature experience. Similar methods can be used with other fruits.

Those who handle frozen fruits, and also other products, may well remember this fact: Held a day at 20 F., products may not show damage, for example, peaches may not turn brown. The next handler, however, may expose the product to minor temperature hazards and find that the damage is conspicuous, and it can't be corrected.

Frozen Concentrated Orange Juice

Several factors are especially significant in the handling of frozen concentrated orange juice. It is a major outlet for the nation's orange crop and a major product in the frozen food industry. It is widely consumed for its vitamin C (ascorbic acid) and other nutritive values. Its color, flavor, and the stability of its cloud are quality factors to which millions of consumers are highly sensitive.

The sealed metal containers protect against access of air and thus limit oxidative reactions, but they also allow thawing that would seriously damage most other containers. The product may seem to be adequately protected, when actually it is undergoing changes that cause consumers to regard it as a low-grade rather than a high-grade product.

Mild Heat Treatment

Tendency to develop instability of cloud (that is, to separate when mixed with water) has led to an industry-wide practice of mild heating in the processing of this product. This practice has improved stability but temperature damage remains as a major problem. Tendency to lose stability of cloud was observed in all samples, but in varying degrees at temperatures above 0 F. Over long periods at 0 F the products gradually lose ability to withstand temperature damage.

In the project some but not all heat-treated samples retained stable cloud in an initial test of 5 days at 10 F followed by a steady rise to 40 F with immediate refreezing to 0 F. All unheated samples failed in this single test. All the heat-treated samples that survived the first test failed in a second similar test later.

In the lower range of exposures for longer times, most unheated samples were able to retain cloud when exposures over a year added up to no more than 24 days at 10 F. Heated samples generally withstood mistreatment twice as severe, but varied. Thus temperature damage accumulates and quickly exhausts the original stability of frozen concentrated orange juice.

Undesirable change in flavor was found to be a slower process than cloud loss, and loss of vitamin C still slower. These losses, however, do proceed faster as temperature rises and eventually add severely to the total quality losses in frozen concentrated orange juice.

Frozen Vegetables

Temperature-tolerance studies on vegetables are incomplete but present data supply general descriptions of quality loss and measurements of rates. Temperature-damaged green snap beans, for example, first darken and later turn olive drab and eventually brown. Peas turn grayish-green and then yellowish as green color is lost.

Trained judging panels are consistently able to detect a color change in beans held at 0 F. in about three months. They can do the same with peas at O F. in about six months. These observations indicate the comparative rates of color change in these two products. They do not evaluate the severity of damage; at zero steadily held, overall quality continues at a high level for at least two years.

The trained panel identifies the same change mentioned above in beans held at 10 F after one month, after 10 days at 20 F, and after about three days at 30 F. For peas the time periods are roughly double in each case.

Undesirable change in flavor of beans is detectable by the trained panel after about three times the periods required for detections of color change at the various temperatures listed above. Flavor change in peas is slightly more rapid. Thus for both vegetables, color changes more rapidly than flavor.

Losses of chlorophyll (green pigment) and of vitamin C are useful measures of loss of quality. In green beans chlorophyll is lost at the rate of about seven per cent per year at 0 F. At this rate high levels would be retained for several years. At 10 F., this rate of loss is about seven times the rate at zero, at 20 F, 20 times, and 30 F. 160 times as fast. Loss rates for vitamin C are similar.

The facts above emphasize the striking increases in rates as temperatures rise higher and higher above zero, and particularly as they reach temperature levels of 25 F, 30 F, and above. Long periods at lower temperature above 0 F, without apparent softening—will result in the same sort of damage.

Frozen Poultry Products

Frozen poultry, like other products, changes undesirably in flavor and appearance with increasing rapidity as temperature rises in the range with which frozen food handlers are vitally concerned. Generally, turkeys are somewhat less stable than chickens. Commercial products, for various reasons, vary widely in stability. To protect all products adequately, however, 0 F. or lower should be maintained as consistently as possible.

Freezer burn from loss of moisture has been reduced by moisture-proof packaging, but another change in appearance, from light to red or darker color, can result from failure to control temperature. Light appearance results from rapid initial freezing and

if the bird is held at 20-25 F. for only one or two weeks, significant darkening develops—especially in young roaster-fryers and broilers.

Whole birds are more stable than cut-up birds in equivalent packages. Flavor change reaches detectability in well-packaged cut-up fryers in 9 or 10 months at 10 F and 5 or 6 months at 20 F., but with less effective packaging these periods may be reduced to one month at 20 F, three months at 10 F, and not over six months at 0 F.

Fluctuation of temperature causes slightly more frost inside packages than in packages of comparable birds held steadily at the highest temperature of the fluctuation. This difference is not important because total moisture accumulation in a tight, moisture-resistant package is so small that appearance of the thawed bird is unaffected.

Prepared Frozen Foods

Products studied thus far are fried chicken, turkey dinners and pies, creamed chicken and turkey products, and sauces and gravies used in such products as a la king and custard and pudding desserts.

The flavor change first detected in cooked poultry meat is loss of "freshly cooked" flavor, which is followed eventually by staleness and finally by distinct rancidity. At 20 F. flavor changes are detectable in fried chicken within less than two weeks, staleness or rancidity develops within six weeks to three months, and mold occurs on pies held nine months. At 10 F. and lower, stability of flavor is greatly affected by exposure of the meat to air. For example, the sauce or gravy in pies protects the meat, and hence dinners, pies, creamed products and a la king are protected against serious flavor damage for as long as 6 to 12 months at 10 F. or lower. Fried chicken, however, suffers damage twice as quickly at these temperatures.

Curdling, separation of liquid, and loss of smoothness are undesirable changes that can develop in puddings, desserts and gravies after they are thawed. Such foods become much more defective in this respect when exposed to temperatures above 0 F. Research has revealed improvement from use of certain thickening agents (such as waxy rice flour) in their preparation, but even improved products are sensitive to temperature damage.

Measuring Temperatures

Improvement in handling of frozen foods depends to a large extent on wide dissemination of information such as that summarized here. Improved temperature protection means more excellent quality delivered from farms and freezing plants to consumers. Every industrial group bears a heavy responsibility. Each must guard against creeping, accumulating damage just as effectively as against sudden damage.

Improved handling means constant attention to product temperatures. Control of product temperatures in turn means measurements of temperature consistently, in the products themselves and in their environments. Frequent temperature measurement enables one to become "temperature minded" and to understand equipment performance as well as quality losses that develop in products.

As an aid to greater and more effective use of thermometers the Time-Temperature-Tolerance Project has included a study of product temperature measurement in cases of frozen foods without destruction of either carton or individual packages. The method simplifies the operation, reduces time required, and produces accurate results.

A metal, disk-type thermometer is used. With a razor knife a small opening is made in the carton wall to reveal where the corner package comes together with the next one. The thermometer stem is simply inserted about three inches in contact with both packages. The cut end of the carton opening is forced against the stem. About five minutes are required to obtain a reading that investigation has shown to be that of the product itself.

Center temperature in the carton can be taken similarly, and if it is higher than the corner temperature it is likely that the carton has been exposed to higher temperature recently. More detailed information is available on this study, and also on the entire project.

Thermometer readings are important. They measure not only degrees of protection but also rates at which quality is disappearing.

The Impact of Frozen Foods on The Warehousing Industry

SHEFFIELD A. KADANE
President, National Association of Refrigerated Warehouses

NOTHING has ever happened to the cold storage industry such as that which happened when the frozen foods industry began producing and expanding at record breaking rates to meet the demand for frozen food products. The terrific impact of the past 20 years has caused many disruptions. Each of us has had to take a new look, and repeated new looks, because of the developments in those years.

One was the need to grow. And our industry has grown, particularly since World War II. From 408 million cubic feet, 28 per cent of which was freezer space in 1947, public refrigerated warehouse space has expanded to 500 million cubic feet, over 60 per cent of which is zero degrees and below. And, we have spent over $100,000,000 to do it.

Summary of paper presented at annual meeting of Frozen Food Distributors Association.

The refrigerated warehouse industry, in keeping with this growth, brought about by frozen food needs, has added new services, modernized facilities, installed new equipment, and cut costs while increasing service. Most important, most cold storage men now think in terms of customer needs and in terms of distribution.

Now, we know you have your problems. We sympathize with you and want to help you. But listen to a problem of ours for a minute. There are a lot of people in this room who have undoubtedly felt that they ought to get into the cold storage business. Some of you have. That's one of our problems! How in the world can we convince you that riding two horses at the same time is difficult, if not impossible? How can we make you believe, as both economists and cold storage men know, that running a storage operation while trying to make profit in the selling business is risky, because obviously you cannot devote full time and attention to either. How can we best point out to you that brick and mortar has to be occupied throughout the twelve-months' period whether it is a hotel, an office building or a cold storage warehouse. Any profit, or even so-called advantages of savings or convenience are as phony as a three-dollar bill.

Another problem of ours which is closely related to the one just stated

is the fact that some of you frozen food people have looked upon the cold storage industry as a bonanza. Nothing could be further from the truth! It costs money, and lots of it, to construct such space. Specifically, it costs a tremendously inflated dollar-plus per cubic foot to build a refrigerated warehouse today, not including expenditures for land and materials handling equipment and machinery. In the face of these costs, distributors and packers have added over 60 million cubic feet of their own freezer space in the past four years. Just think what you could have done with those millions of dollars now tied up in brick and mortar.

As a direct result, occupancy in our industry has gone down. Average public freezer occupancy decreased from 78 per cent in 1952 to 68 per cent in 1956. This has happened during a period when frozen food production increased by 50 per cent with only a nine per cent increase in end-of-month tonnage holdings in public freezers. But let me now tell you what some of you who have built warehouse space have actually said to me: "If I knew what I know today about the problems of running a cold storage operation, I would have stayed out of it. Now I've got a building on my hands that's much too large part of the time, and still too small for one small portion of the year."

Another friend in the packing business said: "I thought I had the answer to a packer's prayer, a new warehouse, and my own controlled labor force, and an investment that would pay off handsomely. Now I find I don't have any one of the three. The new warehouse has become obsolete because of our own production demands. We have no control over our labor force because the unions tell them, and us, what to do. And my terrific investment in brick and mortar and equipment has taken so much operating capital, that I regard my warehouse not as an investment but as an evil that is neither necessary nor economically sound."

Distributors Disappointed

Distributors, too, have voiced their disappointment in various aspects of private warehousing. I have heard people who are attending this convention declare willingly that the use of commercial freezer space is the only answer for them because: Public warehousing creates and maintains more much needed operating capital, when that capital is sorely needed elsewhere. Also, space availability is as flexible as their need for space goes up and down. They pay only for what is used. And finally, that the distributor is relieved for the profitable performance of his No. 1 bread and butter task, trying to make a profit out of this complex frozen foods industry.

If you're going to compete with us by building your own space, you are making it tougher for us to give you the kind of service you want and need. And the results of you trying to run two businesses in one sometimes makes it tough on you.

So, if you're going to make money and I'm going to make money, and we'd better, we must realize the interdependency of our industries. We are going to have to work together toward a realistic cost and operating concept to reach a profit standard that's going to keep us both in business.

The Impact of Frozen Foods on the Poultry Industry

CLIFFORD CARPENTER, President
Institute American Poultry Industries

FREEZING has been an important factor in the growth of the poultry industry, an industry which has virtually doubled its per capita consumption since World War II. Per capita consumption in all forms last year accounted for 24.3 lbs. of chicken and 5.1 lbs. of turkey. The year 1957 will show still another increase in turkey and chicken consumption.

It is estimated that about 30 per cent of all poultry processed is frozen. Turkeys, ducks and geese lead the list percentagewise. Eighty-two per cent of turkeys are frozen, 66 per cent of ducks and geese, 45 per cent mature chickens, 12 per cent fryers and other young chickens. So, the quick freezing of poultry has reached a relatively high degree of use and popularity. Further increases in the proportion of poultry frozen may come, but a continuation of past trends is not necessarily assured. Among several developments in the industry which tend to reduce the need for freezing are: (1) the fryer-type turkey, providing birds on a year-round basis and reducing the need for freezing; (2) anti-biotics, which help lengthen the shelf life of fresh poultry; (3) highly integrated retail store distribution, which facilitates the distribution of fresh chilled poultry and reduces need for the frozen product; and (4) improvements in processing and transportation, which speed up the marketing process and reduce need for freezing.

The one area in which frozen poultry is expanding, and is likely to expand even more, is that of prepared foods. Chicken and turkey dinners, pre-cooked fried chicken, pre-cooked barbecued chicken, stuffed turkey. In fact, quick freezing made it possible to produce pre-cooked items with flavor and fresh-cooked taste. But to get and hold steady customers for frozen poultry, confidence in quality must be built up. Disappointments in quality have stopped many consumers from becoming frequent buyers. We are painfully aware, for example, of what happened to chicken pot pies, when the competitive price race caused some processors to lose sight of quality goals, and when consumption began to drop instead of continue its skyrocketing ascent.

Given adequate case space, frozen poultry can corner a good percentage of poultry sales and, at the same time, produce a reasonable profit. But isn't one of the greatest deterrents today (and for the past several years) to the sale of frozen fryers and fryer parts, an unrealistic pricing policy? First, the processor probably charges a higher markup on it even after allowances for extra costs such as packaging and freezing. Next, the distributors in general work on cost plus a too high percentage. And finally, the chain stores, in general, have been charged with using unrealistic pricing policy.

Summary of paper presented at annual meeting of Frozen Food Distributors Association.

Refrigerated Warehouse Service Function

REFRIGERATED warehouses are refrigerated service companies and the service is more important than the storage function." These words from an article by Arthur N. Otis, president of Merchants Refrigerating Co., in Poultry Processing & Marketing, June, 1957, command wide attention. Well equipped and well managed warehouses have everything that a producing industrial community needs in the way of year-round services, including not only storage, but also freezing, various other refrigeration services, technical assistance in financing and marketing and numerous other services that together spell efficiency and success.—TRRF Bulletin

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WRITE FOR AVAILABLE LITERATURE

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44 YEARS OF CONTINUOUS ACHIEVEMENT IN HEAT TRANSFER

Accelerate in '58 Is Theme of 40th Annual NAII Convention

ICE manufacturers numbering nearly 500 from throughout the United States and Canada gathered in Detroit November 12-15, at the Statler Hotel for the 40th Annual Meeting of the National Association of Ice Industries, to take a long look at the present status of their industry and to lay plans for increasing the sale of their frozen commodity, through intensive merchandising plans.

"Accelerate in '58", the adopted theme of the convention, was keynoted by retiring president E. L. Gunn Jr., Atlanta, Ga., who used the well-known product of Detroit – automobiles as a parallel example to the business of ice manufacturing.

Said Mr. Gunn, "There is some parallel between the automobile industry and the ice industry in that both had very humble and modest beginnings. Both began to grow as their product became of service to mankind. While the value of the unit sale of the products is in vast difference, the market is the same. Just as each person is usually, sometime in their life, in the market for an automobile, so each person is also a potential customer for ice. While the use of motor vehicles is identified with the movement of all transported items, substantial ice has been used and is still being used in the transportation of perishable foods and certain other products.

"The automobile industry and the ice industry have another parallel. Both are highly competitive. Many enterprises have become casualties while those which survived were fighting and jockeying for position.

"Both industries are volume industries, that is, are of the type which require substantial capital investment with heavy fixed charges, and in which profits are created very fast as sales increase above the amounts necessary to cover charges. By the same token, a few percentage points decrease in sales usually results in greater proportionate decrease in net profit.

"Despite these and many other similarities, there is also a vast difference between the two industries. I believe the greatest difference has been the ice man's unwillingness to properly advertise and merchandise his product, and the failure on the part of the industry to support a program of research to hold old markets and create new uses for ice and this has resulted in a terrific attrition of sales and earnings. The volume of ice manufactured in the United States and Canada may be greater now than at any time in our history but, unfortunately, it is not made by members of the ice industry. The volume of ice manufactured on premises by users themselves in the whole range of uses, from soda fountains to heavy industrial processors, is an indication of our merchandising weakness.

"Those of us remaining in the industry find ourselves in a defensive position, cutting costs, many times unwisely, in an effort to salvage some profit out of our sales income. The unwillingness of many segments of the industry to reinvest funds in the business, to lower costs and provide sales outlets, has spelled their doom.

"I know that the problem of staying alive in the ice business with only 50 percent of our peak tonnage sales is no easy task. Many of us have come to this convention from areas where sales for the current year are off 25 percent. Oftentimes we find ourselves asking "Is It Worth While? How can I cut expenses further? Is the NAII worth while? Would I have any real savings if I dropped my membership to save my dues? Had I best salvage what I can out of the disposal of my ice plant and put the money to work in some other venture? These are all good questions because the proper answer will determine our economic well-being five or ten years from now."

Opening the convention, Executive vice-president William T. Jobe, Washington, acknowledged his responsibility to the association and stressed the need for all members to have greater respect for their organization.

He further said "As we attempt to conceive possible improvements in the management of your association, I would like to believe a way might be found to cause you and the industry members who aren't here to have a greater respect for your national organization. In our contacts with other industry organizations, we find that they are made up, by and large, of people who are very proud of their organization. What's more, they utilize the service of their organization regularly and they turn to them for primary and professional advice and guidance. Such is not the case with scores of members of this association. Far too many ice companies from coast to coast and border to border, look upon NAII more or less as a charitable organization and one for which sentiment presumably outranks their faith and appreciation for the work it can perform."

Treasurer's Report

Treasurer George Steers, Kalamazoo, Mich., reported that in accordance with instructions of the Executive Committee, the association's budget had been brought into balance and at the same time cautioned that if new markets are to be developed "we must initiate and carry out some industrial programs which are not presently underway, and for which no provisions are made in the present or any contemplated budget."

Emphasizing the need for an industry-wide program of action, Mr. Steers pointed out "Now that we are in a position of a balanced operating budget for our present activities, it would seem that

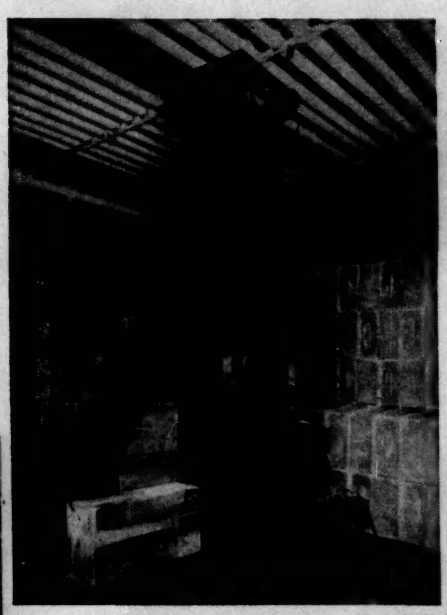
National Association of Ice Industries Banquet, Detroit, November 14.

For maximum efficiency in ice-tiering operations, Gifford-Wood manufactures three compact, well engineered, portable ice-tiering units. They provide the full range of service needed to handle 300- and 400-lb. ice speedily and safely, in all plants from the largest to the smallest. Built to Gifford-Wood standards of durability.

One of these will exactly suit your requirements . . .

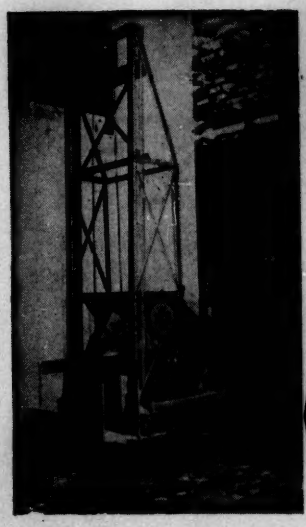
TYPE "LA"

An electrically operated (3 hp) automatic tiering machine for 300- and 400-lb. ice. Solenoid type holding brake and cut spur gears to drum shaft, speed 113 fpm, stack to 10 tiers. Complete with visual tier-finder, push-button control, plug and receptacle.



TYPE "N"

Identical in structural design to Type "LA", but motor, brake and winding drum are directly connected to enclosed worm gear reducing unit for compact power drive. Designed for ease of adjustment and accessability. Wired in accordance with Underwriters' specifications.



TYPE "QR"

An electrically driven tiering unit for the smaller plant. Speed, approximately 50 fpm with 1 hp power requirement. Easily moved on two fixed casters by special lift-about attachment. Excellent durability with great portability.

For full information on any of these units have a Gifford-Wood representative call, or write for Bulletin 451.

GIFFORD-WOOD CO.

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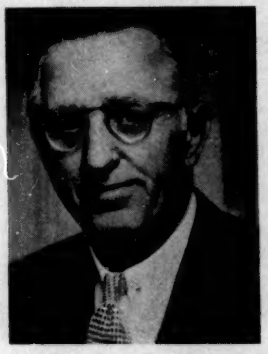
New York 17, 420 Lexington Ave. • Cleveland 20, 3537 Lee Road
St. Louis 1, Railway Exchange Bldg. • Chicago 6, 565 W. Washington St.
Pacific Coast Representative: Western Ice Equipment Company, 420 Market St., San Francisco 11



Richard C. Muckerman
President NAII

Paul W. Easton
Vice-President NAII

P. A. Buehrman
Vice President NAII

George Steers, Jr.
Treasurer NAII

the time was here to launch a new activities program, financed from the bank balance, which will aid in putting some life back into the industry and its membership.

"It has been pretty well-known in the last five years, that there is a substantial volume of ice business available at high selling prices if we will make the ice available to the public, conveniently, in package form.

Pass the Ammunition

E. K. Wellman, City Products Corp., Detroit, a member of the Detroit Convention Committee, encouraged additional vending machine manufacturers to investigate the potentialities of the industry as it is the one avenue of important sales the ice manufacturer is developing. He pointed out that in Detroit alone, some 180 vending stations are in operation.

Concluding the first day's session, Secretary of State James M. Hare, of Michigan, made an appeal to stop the "slaughter" occurring annually on our highways.

Production Changes in Processing

Richard C. Muckerman, Vice-president of the association, introduced J. M. Twomey, City Products Corp., Cincinnati, to open the Wednesday session. Mr. Twomey discussed production changes in processed ice. The speaker stated that they had converted an idle storage to the processing of packaging ice. He also reviewed the changes made in the merchandising of premium ice. Mr. Twomey said they hand-close all bags—no mechanical method being used, and delivery to sales outlets is made in refrigerated trucks.

The speaker then showed a film taken at the City Products plant, illustrating the complete cycle of production from the manufacture of block ice to its ultimate delivery at the vending machine.

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Lee Gutierrez, Biloxi Freezing Company, Inc., 402 Bohn Street, Biloxi, Mississippi

R. G. Hadley, Southern New England Ice & Oil Company, Drawer W., Station A, Hartford 6, Connecticut

George W. Heath, Oscar Mayer & Company, 901 Mayer Avenue, Madison 1, Wisconsin

D. M. Howell, Colonial Ice Company, 516 Guilford Building, Greensboro, North Carolina

William J. Lewis, Jr., Rochester Ice, Inc., P. O. Box 940, Rochester 3, New York

Harold Margolin, Ice Service Company, 2402-14 Vine Street, Kansas City, Missouri

Frank A. Mitchell, Newport News Distilled Ice Company, 4336 Kecoughtan Road, Hampton, Virginia

D. J. Mulvihill, City Products Corporation, 33 South Clark Street, Chicago 3, Illinois

Allen Rushton, Birmingham Ice & Cold Storage Company, P. O. Box 1751, Birmingham, Alabama

J. C. Thompson, The Southland Corporation, 2828 North Haskell, Dallas, Texas

M. W. Young, National Ice and Cold Storage Company, 55 Division Street, San Francisco 3, California

As I See the Business

J. C. Thompson, The Southland Corp., Dallas, speaking on his observations, gave his audience a keen insight of his idea of the ice business of today. His company operated 22 plants in 1957 and they sell one-half as much ice now as in the 40's; they also make one-half as many dollars. However, because of good maintenance so that full capacity can be maintained at peak seasons, it is his opinion that the company made more net profit in 1957 than in 1953-54.

Promoting the Use of Ice

Ideas for the merchandising of ice were presented by speakers from widely scattered areas—St. Petersburg, Fla., Amarillo, Tex., and Detroit.

George W. Stovall, Jackson Ice Co., St. Petersburg, Fla., stressed the importance of the use of well-lighted electric signs; follow-up advertising in local papers, etc.; placing ice vending machines in company-owned gas stations is not always easy to do, but can be accomplished; a small advertisement regularly in daily papers, or a short commercial announcement on radio—the latter idea he thought being more productive. Mr. Stovall stated that his company has eight vending machines and thirty-six commercial low temperature boxes in retail outlets, and believes that continuous advertising produces results. At his cost of manufacturing and bagging, his company receives 25 cents for a ten-pound bag, for which the retailer receives 35 cents. He feels his margin of profit enables his company to establish a good budget for advertising. They now have fifty locations and have received one hundred eighty-two requests for vending machines. He strongly emphasized the necessity of informing the public where stations are located. Concluding his remarks, the speaker showed colored slides of retail storage boxes and vending machines on location; also, the effects of electric signs in daylight and at night.

Charles E. Lamka, Amarillo Ice Co., Amarillo, Tex., stated the company had an idle ice plant on a railroad track which they decided to modernize and secure a financial return. They were successful in leasing the building for merchandise storage at a good return.

In Mr. Lamka's opinion, the only way to sell ice is in processed form. Processing by hand is too costly and the "snow" proved a nuisance and had to be continually removed. With an automatic ice cube maker, the power cost was twenty percent higher but the overall efficiency was far ahead of hand processing. They use radio advertising to inform the public of the convenience of "Arc-Ice" and offer an eight pound give-away sample bag. This merchandising program tripled sales in three months. With two precent spent on advertising, including radio, they will make more this year than any other year since the war. Reducing costs one percent will raise profits ten percent, reported the speaker.

Vending Operation—Life Saver

Walter J. Hintz, Borin Bros. Inc., Detroit, claims that vending stations are going to be the foundation of the ice business of the future. Reported Mr. Hintz, "It was in 1948 that our company was beginning to have an over-abundance of ice. In addition, we could not rely upon our people to distribute our ice, let alone sell it. We could not render the type of service we would like to because of the irresponsible help and of course, the domestic customer was rapidly becoming a thing of the past. So, we decided to investigate the possibilities of ice vending. After some deliberation we decided to install venders at one of our sub-stations, and in the course of eight months that installation paid for itself. Now, we also discovered that we were getting the money which rightfully was ours, and because of this large consumer demand for ice, day and night, we were convinced that ice vending offered a promising future. We knew it would require an outlay of a large sum of dollar capital, but we also knew that we couldn't put ice into the bank.

"So, we set up a quota of four stations in the first year. Our first ice vending station was placed in a district which is predominantly apartment houses where folks pay anywhere from three to five hundred dollars monthly rental. We knew that this class of people do a lot of entertaining; that they had the money to pay for our product and that they always bought the best things. So, why shouldn't they buy the best ice? This vending station sold $9300. worth of ice during the first year. The four combined stations the very first year sold a total of $31,000. worth of ice. So, each year we set a quota of stations for each succeeding year until we had placed ice on every main street in Greater Detroit.

"Because of the fine spirit that existed among the ice folks in locating ice vending stations throughout Detroit, no one company dominates the field. Today, the three ice companies own and operate one hundred seventy-two ice vending stations—all strategically located—no station being closer than a one and one-half mile radius. Our company owns and operates sixty-three Ice-O-Mats. The balance are divided between the two other companies. Ice-O-Mat is the name our company adopted for the automatic ice vending station. Here we are with one hundred seventy-two Ice-O-Mats and about sixty freezer chests in Greater Detroit, and I don't believe anyone is losing money. Ice vending is a highly lucrative business. It is producing a new revenue which, moneywise, will help offset those lost tonnages. Greater Detroit has 3,700,000 people to support these two hundred seventy-two stations, and I don't believe we have reached a saturation point as yet.

In the discussion following the "round table" presentation of the three speakers, Mr. Stovall pointed out the need for both freezers and vending machines. Mr. Hintz stated that funds for national advertising could be secured if each of the 90,000 vending stations operating in the United States were assessed $125.00 each, which would bring in over a million dollars.

The concluding speaker for the Thursday meeting was W. Allan Campbell, Attorney, and Vice-president and Secretary of Canadian Westinghouse Co. Ltd., Hamilton, Ont., who gave an interesting viewpoint on how an outsider looks at the ice business.

The Future of Car Icing

Jean Brunelle, H. Brunelle Ltd., Canada, in discussing the use of ice for car icing, stated that the railroads experimented with mechanical refrigeration for car cooling over thirty years ago, and are again turning to ice, as temperatures can be controlled down to as low as 4°F. The cost for mechanical refrigeration, thought the speaker, was too high with only fifty percent efficiency, and subject to frequent mechanical difficulties.

Ice Ahead

John H. Glenn, Glenn Ice & Fuel Co., and Mayor of Beardstown, Ill., was optimistic about the future of the business if the industry would adopt a positive approach to modern merchandising methods. The industry can find profitable new markets in truck icing and as another example—apple storage. This latter market will bring his company an additional fifteen hundred tons this year. Mr. Glenn stressed the need of issuing bulletins to all employees for suggestions on cost cutting, believing that all brains are not in the front office.

The association secretary, C. P. Austin, talked at length on "Minding Our Business". Mr. Austin stated that he fills a new role each time he goes before a group of ice manufacturers. He observed that there is more practical and profitable business ideas to be found at each convention, and ice manufacturers failing to attend these meetings were losing much.

Practical Refrigeration Engineer

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Operating engineers of all refrigerating plants are invited to affiliate with the National Association of Practical Refrigerating Engineers, Inc., an educational association, "not-for-profit".

From the President's Desk

Most encouraging to any new officer is the knowledge that leaders in the industry are solidly behind an educational effort such as put forth by NAPRE. Such was very vividly indicated by the number of Industrial Members who had their representatives present at the traditional breakfast session on Wednesday November 20, at the 48th Annual NAPRE Meeting just concluded. In addition to the eight members renewing for 1958, the Association presented certificates to three new sustaining members, two sponsoring companies and seven contributing (local) firms.

NAPRE has Worthwhile Educational Program

Among the statements made by officials of the firms represented through Industrial Memberships were the following:

"The decision of the Howe Ice Machine Company to become an industrial member of NAPRE is based primarily on the fact that this organization, more than any other in the refrigeration industry, has a worthwhile educational program.

"In our present day complex industrial economy, the operating, maintenance and planning engineer, in charge of refrigeration and air-conditioning, must know more about more things than ever before, and NAPRE gives him that chance for knowledge", H. B. Howe, Howe Ice Machine Company.

"In the manufacture of our units we try to make them as heavy duty as possible so that both the user and ourselves can take pride in the installation, and so that the equipment will give many years of satisfactory use. However, unless this equipment is properly applied and operated, the care that went into its design and manufacture is wasted. Through NAPRE and its fine educational program, operating engineers have had an opportunity to learn more about all types of refrigerating equipment and overcome some of the problems that have occurred on the users end.

"By the same token these engineers have contributed greatly to the development of better equipment through their experience and knowledge which has been passed on to the manufacturer. So, the net results is that the user and manufacturer have been brought closer together for the benefit of all.

"We at Baltimore Aircoil Company are very pleased to now be industrial members of NAPRE and for the opportunity to participate in its fine educational program. . . . We only hope we can be of as much service and as helpful to the NAPRE organization, as its members have been to us", W. E. Kahlert, Baltimore Aircoil Co.

Accepting the sustaining Industrial Membership for the Vilter Manufacturing Company, A. A. Silverman, President, related how he had been approached by the Association concerning a statement as to why his firm had been interested in this class of membership. He humourously described himself as being unprepared to make a statement and therefore he felt that those present at the breakfast session would not feel unkindly toward him for doing a little bragging concerning the Vilter Corporation. After laying claim to production of nothing but the best in the refrigeration line, the Vilter president pointed out that even among the best there is sometimes numerous slip-ups, even ever so little. That, he explained, is where the practical engineer came in. The manufacturer would never know how many such conditions exist when a piece of equipment leaves the plant, if every practical engineer in the country were a member of NAPRE. He said he felt quite certain that many oversights were remedied in the field by the experienced practical man and therefore his firm felt an obligation toward continuing the educational effort of his representative group.

Education Is Industry's Biggest Problem

"We, here at Recold," said Hy Jarvis, President, "believe that education is this industry's greatest single problem. Installation and maintenance standards cannot be raised without a long-range plan for industry-wide educational improvement. And, when we cannot raise these standards, the entire industry suffers—from the manufacturer to the ultimate consumer.

"By standing behind NAPRE's educational program, we not only improve the installation and maintenance of Recold equipment in the field but, most important, we support the people who are most actively concerned with the educational progress of the industry".

Frank L. Chase

Some things are tough to get at...

That is Professor Tennis C. Williams in the picture. He has concluded, and rightly, that the nesting grounds of the Tyrolean Whooping Manscratcher (the only bird with a poisonous bite) are real tough to get at.

But compared with getting at certain working parts in certain evaporative condensers, the nest of the Manscratcher is as accessible as apple pie in a cafeteria.

That's why service men are sometimes tempted to use burglar tools, and maybe some nitro, when the job calls for getting at inner working parts that need normal servicing from time to time.

On the other hand Recold Dri-Fan Condensers—the best in every other respect too—are engineered for easy access. Just remove a few screws and go right on inside. With Recold's patented access door, spray nozzles and float valves are easy to get at, too.

When it comes to inspecting and cleaning drift eliminators—on some condensers the service man yells for a blow torch. To get at the drift eliminators on a Recold Dri-Fan Condenser you just remove the screws and pull them out like a drawer... yet joints are tight and leakproof without gaskets or sealing compounds. It's a matter of engineering and patented design.

Be sure the evaporative condensers you invest in have ACCESS. Be sure you ask for Recold's Dri-Fan!

RECOLD CORPORATION

7250 East Slauson Avenue, Los Angeles 22, California

GROUP OPERATION

CONTROLS AT SOUTHDALE

Conclusion

HOWARD A. WOLFBERG
Guest Editor

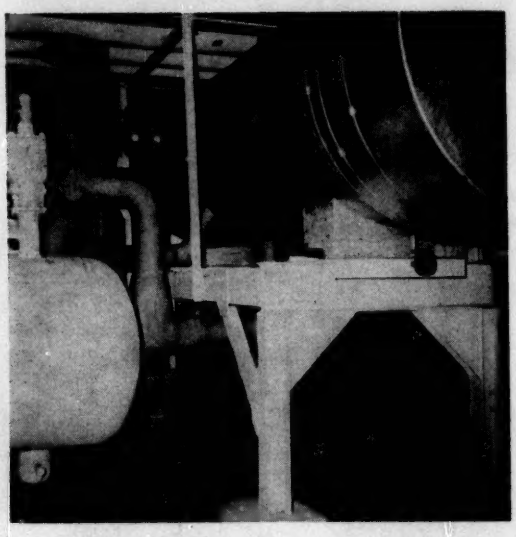

Fig. 9—Refrigerant-12 level in each of two water coolers is regulated by a popular boiler feed control pictured. It is believed that this application is the first in the low pressure refrigerant field.

COMPLEX control systems are essentially a series arrangement or group collection of elementary systems. When a system is analyzed from that point of view, the practical man can confidently pick the layout apart and fix in his mind the function of each minor circuit or system arrangement. Once understanding the basic application, the branches or steps are again arranged to get the complete picture.

First installment of "Controls at Southdale" discussed the automatic operation of a power unit and its connected compressor, as an individual unit. This concluding installament will deal with the automatic controls which cause all five power units and compressors to operate as a coordinated group.

Water Cooler Liquid Feed

Low pressure liquid level control is used on each (two) water coolers. Arrangement consists of a Fisher Level-trol operating an automatic refrigerant liquid feed valve pneumatically (see Fig. 9). This arrangement is popular as a boiler feed control, and as far as is known this is its first application in refrigeration. This is unusual for a refrigeration application, but nevertheless it has proved extremely reliable and effective.

The Refrigerant-12 level in each cooler is sensed by the Level-trol, which is a semi-hermetic, displacement type, liquid level pneumatic controller. This controller transmits an air pressure in proportion to the liquid level in the cooler. The set point and modulating range of the controller can be adjusted conveniently with dials, which means that an operator can readily change the height of the liquid level and the amount of liquid level variation in the cooler.

Attendants at the 48th Annual NAPRE meeting in Chicago last month had the opportunity of discussing "Controls at Southdale" with the Author. First installment of the article appearing in November Industrial Refrigeration was reviewed, and the concluding installment (printed here) was briefed. Following those remarks, Wolfberg handled a question-and-answer session on the Southdale Project.

With this installment, the NAPRE Committee concludes the 1957 operational series. In 1958, the Commitee hopes to further diversify this practical instruction. Comments from NAPRE members and IR subscribers are welcome, as always. Please address correspondence to the "Practical Refrigeration Engineer" Dept. of the magazine.

Leroy Etzel
Educational Director, NAPRE

An automatic, normally closed modulating valve with a pneumatic operator is connected to the branch air line from the liquid level controller (see again Fig. 9). This modulating valve is located in the high pressure liquid refrigerant line feeding the cooler from the receiver. It functions as an expansion valve to maintain the liquid level called for by the controller. The valve has modulating characteristics superior to conventional refrigeration controls.

A three way, E.P. solenoid valve is located in the branch line from controller to valve operator, and air is exhausted from the pneumatic valve operator whenever the E.P. valve is de-energized. This action closes the modulating valve and positively shuts off the high pressure liquid refrigerant to the cooler.

The pilots for the E.P. solenoid valves of the liquid level control sets are wired to an instantaneous set of normally open (NO) contacts on each Relay C serving a control set (see Fig. 5). This provides that liquid cannot be fed to the coolers unless one or more power units are operating and have terminated cranking after startup. Fig. 10 shows the pilot E.P. valve in the upper left corner, and indicates a portion of the parallel wiring to each Relay C.

Group Safeties And Alarms

Refrigeration system safety controls are utilized in addition to the compressor safety controls previously described. Safety Controls P, Q, R and S shown at left in Fig. 10, are water pressure differential switches piped to the inlet and outlet water connections of the two coolers and two condensers. A stoppage or substantial decrease in water flow through any cooler or condenser during plant operation will cause one or more of the safety switches to open its contacts. Consequently, Relay J, mounted at left of the gas engine control panel, will drop out.

Temperature Controllers V and X sense the liquid Refrigerant-12 temperature in the flooded water coolers. If the refrigerant temperature should ever become so low that water freeze-up is possible, one or both of the temperature controller contacts will open to de-energize Relay J.

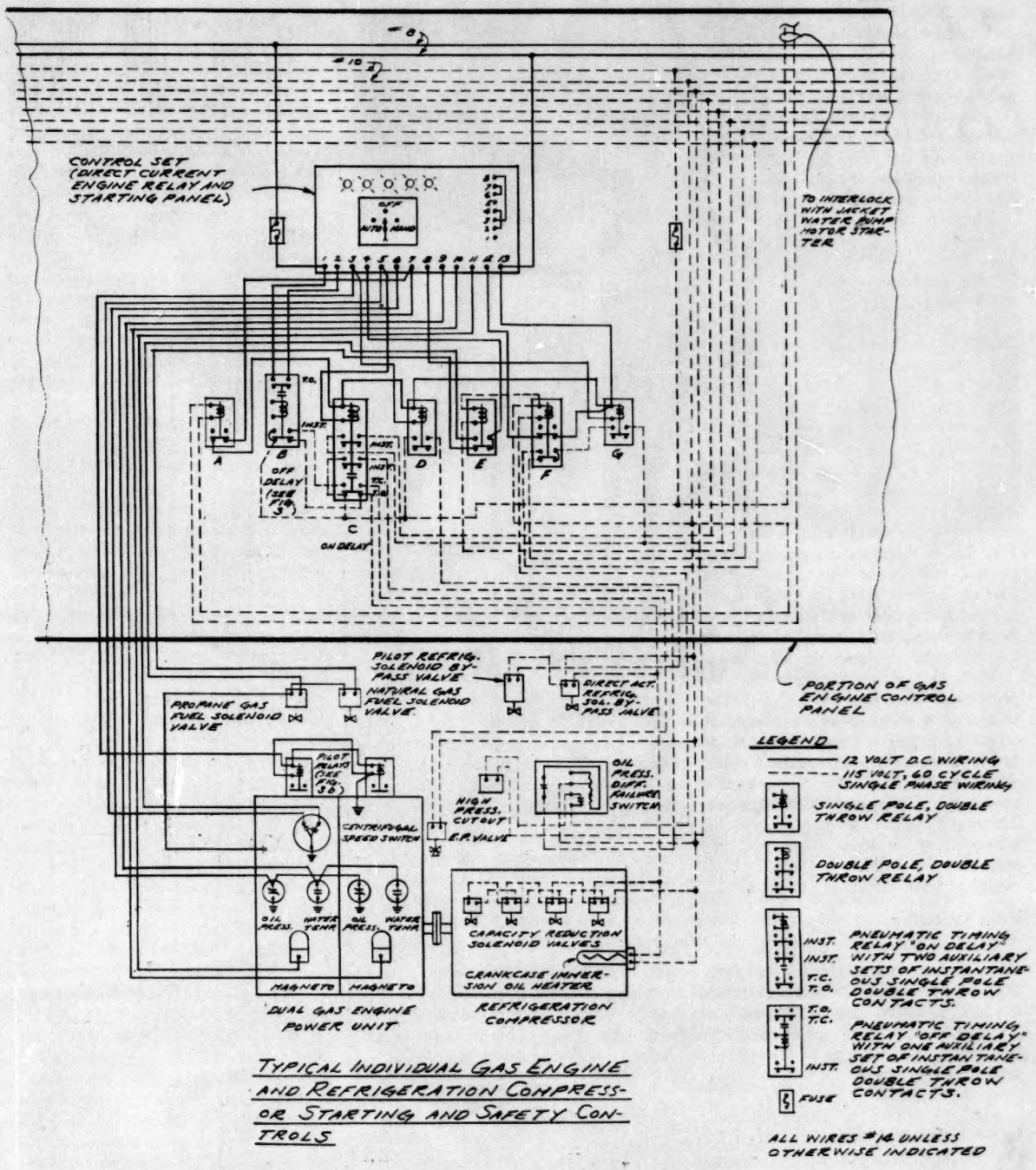
CONTROL SET (DIRECT CURRENT ENGINE RELAY AND STARTING PANEL)
TO INTERLOCK WITH JACKET WATER PUMP MOTOR STARTER
OFF
MANUAL
AUTO
A
B
OFF DELAY (SEE FIG. 3)
C
ON DELAY
D
E
F
G
INST.
T.O.
T.C.
PILOT REFRIG. SOLENOID BY-PASS VALVE
NATURAL GAS FUEL SOLENOID VALVE
PROPANE GAS FUEL SOLENOID VALVE
DIRECT ACT. REFRIG. SOL. BY-PASS VALVE
PORTION OF GAS ENGINE CONTROL PANEL
PILOT RELAYS (SEE FIG. 3B)
CENTRIFUGAL SPEED SWITCH
HIGH PRESS. CUT-OUT
E.P. VALVE
OIL PRESS. DIFF. FAILURE SWITCH
OIL PRESS.
WATER TEMP.
MAGNETO
CAPACITY REDUCTION SOLENOID VALVES
CRANKCASE IMMERSION OIL HEATER
DUAL GAS ENGINE POWER UNIT
REFRIGERATION COMPRESSOR
LEGEND
12 VOLT D.C. WIRING
115 VOLT, 60 CYCLE SINGLE PHASE WIRING
SINGLE POLE, DOUBLE THROW RELAY
DOUBLE POLE, DOUBLE THROW RELAY
PNEUMATIC TIMING RELAY "ON DELAY" WITH TWO AUXILIARY SETS OF INSTANTANEOUS SINGLE POLE DOUBLE THROW CONTACTS.
PNEUMATIC TIMING RELAY "OFF DELAY" WITH ONE AUXILIARY SET OF INSTANTANEOUS SINGLE POLE DOUBLE THROW CONTACTS.
FUSE
ALL WIRES #14 UNLESS OTHERWISE INDICATED
TYPICAL INDIVIDUAL GAS ENGINE AND REFRIGERATION COMPRESSOR STARTING AND SAFETY CONTROLS

Fig. 5—Diagram of typical individual starting and safety controls for gas engine and refrigeration compressor.

Temperature Controllers W and Y sense the water temperature discharging off the coolers and, if this temperature should ever drop dangerously low, Relay J will be de-energized.

A refrigeration system master High Pressure Cut-Out T and Low Pressure Cut-Out U will drop out Relay J if the plant discharge pressure should become dangerously high or the evaporator pressure should become dangerously low.

One set of normally open (NO) contacts of Relay J is wired in series to all the refrigeration compressor safety controls. If Relay J should drop out as a result of action of a group safety control, all compressor safety control circuits will be de-energized because Relay F, serving each control set (see Fig. 5), will also drop out. This action will immediately shut down all power units and cause the compressor safety pilot lights in all the control sets to be illuminated.

A second set of (NO) contacts on Relay J will de-energize the automatic temperature control system and bring it to the "Off" condition if a group refrigeration safety control should operate.

Remote Protection Center

The Southdale Shopping Center has a protection office, remote from the machine room, which is continuously manned by supervisory personnel. At a future date, intentions are

to install the necessary wiring which will permit alarms to register in the protection office should a gas engine, compressor or refrigeration system safety control ever shut the plant or a power unit down. Therefore, the following discussion will assume that the wiring between the gas engine control panel and the protection office has already been installed.

Previous mention was made that Relay G, serving a control set (see Fig. 5), is energized if a power unit should shut down from an engine safety control. In this case, a circuit from the control panel will be completed to an alarm bell and light in the protection office. The wiring from the control panel to the gas engine alarm and light in the protection office which is shown at the right hand side in Fig. 10.

Reviewing, the action of any compressor safety control will cause Relay F to drop out and Relay G to energize for a particular control set (see Fig. 5). A refrigeration group safety control will cause this same action for all control sets. In either case, a circuit from the control panel will be completed to a second alarm bell and light in the protection office.

With the above arrangement, the protection office is alerted if a power unit is shut down from an abnormal operating condition. In addition, it is indicated to the protection office whether the difficulty is with the power units or refrigeration system. Therefore, either a gas engine or refrigeration serviceman as appropriate, can be called if the plant is running unattended at the time.

Fuel Transfer

Previous mention was made that Relay E, serving a control set (see Fig. 5), determines whether a power unit operates on natural gas or propane fuel. Natural gas is used for fuel when this relay is de-energized, and propane gas is used when this relay is energized.

Fig. 10 shows a three position, fuel transfer selector switch wired to the holding coils of all E relays, which are connected in parallel. When the selector switch is in the first or top position all the E relays will be energized, and the power units will operate on propane gas. All the E relays will be de-energized when the selector switch is in the second position (indicated by the arrow), and natural gas will then fuel the power units. The third or bottom position of the selector switch will permit a push button station in the protection office to energize or de-energize the E relays under special or emergency conditions.

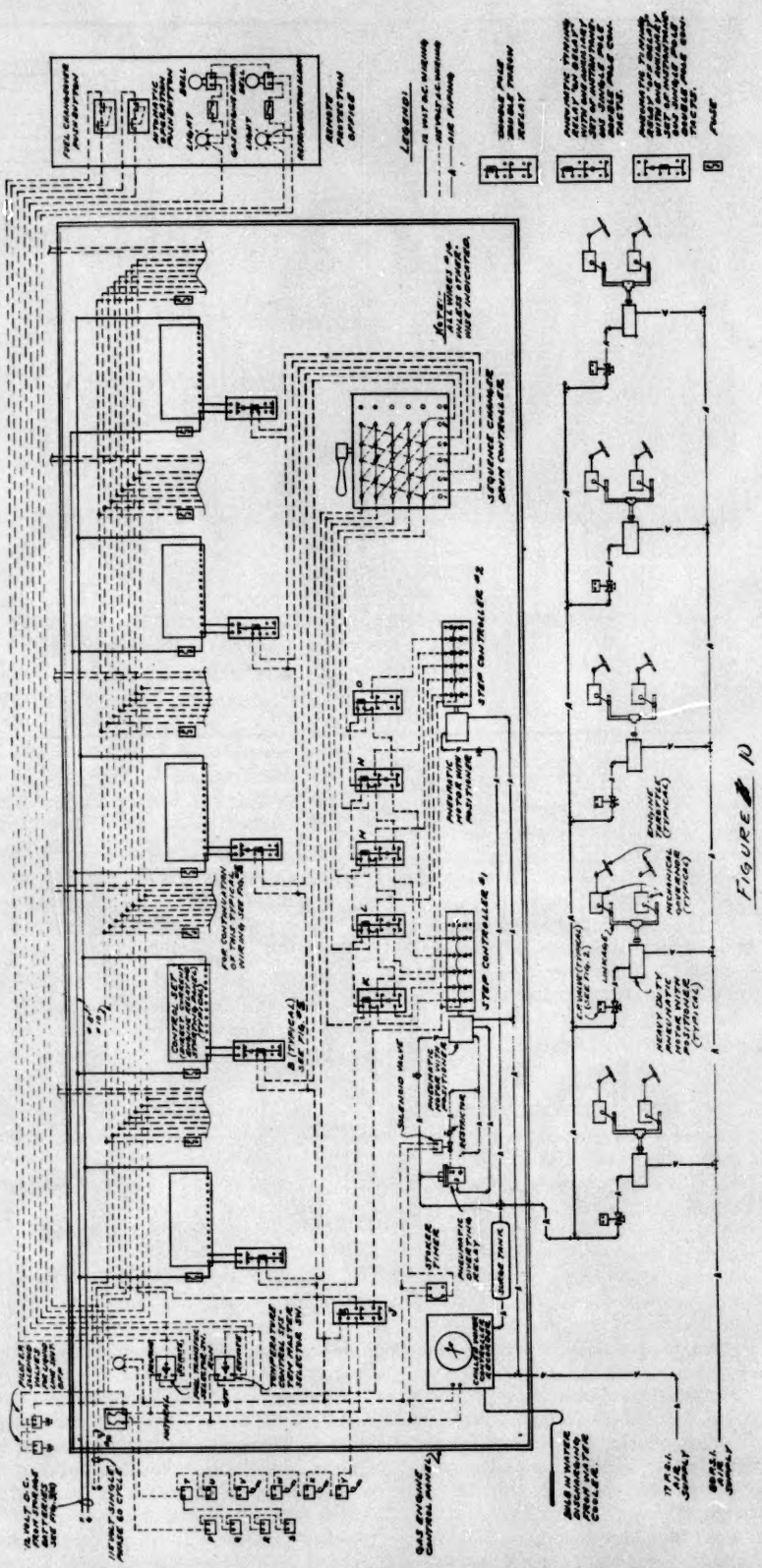

Fig. 10—Group operation of the five compressor units at Southdale is controlled by the system pictured here. Most of the controls are located on the gas engine control panel which was pictured on the title page of the first installment. Devices and wiring external to the panel are located on the various equipment in the machinery room and in a remote protection office to be added.

Temperature Control System

The automatic temperature control system starts and stops the power units and varies their speed in accordance with the load on the refrigeration plant. The controlled variable is the temperature of the water discharging from the coolers, and the control system functions to maintain this water temperature at a constant 40° F. An increase in refrigeration load on the plant will cause the water temperature to rise. In turn, that will cause the automatic temperature control system to start additional power units or increase their speed, or both. A decrease in refrigeration plant load will cause the water temperature to fall and power units will be stopped or their speed will decrease.

Fig. 10 shows a recording type, pneumatic temperature controller at lower left. This device which senses the water temperature from a bulb in the water line discharging from the coolers. The proportional band (throttling range) and set point of this instrument are adjusted so that a rise in water temperature from about 38 to 42 F will vary the branch line output air-pressure from 3 to 13 psi.

The branch line from the controller is piped in parallel to all the pilot positioners of the pneumatic motors linked to the gas engine mechanical governors. As previously described, the positioners and minimum governor settings are adjusted to vary the operating speed of the power units from minimum to maximum as the branch pressure increases from 4 psi to 13 psi. This means that the speed of the compressors will vary from approximately 750 rpm (idling) to 1800 rpm (top speed) as the water temperature rises from about 38½ to 42 F.

Two step controllers which are driven by pneumatic motors with positioners are shown at center of Fig. 10. The pilot connections on the positioners are piped to the same branch control line from the pneumatic temperature controller which determines the speed of the power units. The throttling range and set point of Step Controller No. 1, in conjunction with the cam settings of its switches, are such that the normally open (NO) contacts of the six switches will close progressively as the branch pressure rises from 10½ to 12 psi. These same switch contacts will open in reverse order as the branch pressure falls from 12 to 10½ psi. No contacts of the six switches in Step Controller No. 2 will close progressively as the branch

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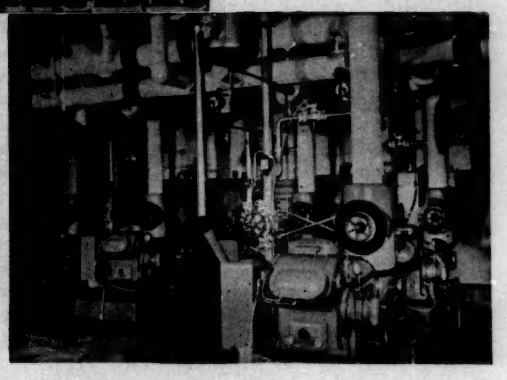

Shown are the five Vilter six-cylinder ammonia compressors which provide most of the refrigeration. Other Vilter equipment includes: evaporative condensers, Pakicer, for their ice requirements in kitchen and bottle beverage room service, shell and tube brine coolers to supply cold brine for the kitchen refrigerators and cold storage rooms, and air conditioning units. Complete automatic control is provided.

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pressure rises from 3 to 4½ psi, and, these same contacts will open in reverse order as the branch pressure falls from 4½ to 3 psi.

Sequence Unit Operation

Holding coil of Timing Relay K is wired so that it will be energized through the first switch of Step Controller #1 at a branch line pressure of approximately 10½ psi. When Timing Relay K pulls in, it in turn will cause one of the B relays serving an individual control set to be energized. One of the power units will then begin its starting sequence.

The holding coil of Relay K is also wired through the first switch in Step Controller No. 2. Therefore Relay K will not be de-energized until Step Controller No. 2's first switch breaks contact at approximately 3 psi. This sequence will occur even though the first switch of step controller No. 1 will have already opened. When Timing Relay K does drop out, the B relay previously energized from it will also drop out, and the power unit so controlled will begin its idling period prior to stopping.

This control sequence functions so that a power unit will begin to operate at a high water temperature of about 41½ F and will continue to operate until the water temperature falls to its minimum operating control point of 38 F.

Timing Relays L, M, N and O are wired through the second, third, fourth and fifth contacts respectively of Step Controllers No. 1 and No. 2. They function in the same manner as timing Relay K. The sixth set of contacts in Step Controllers No. 1 and No. 2 are for use with the future compressor. Additional power unit control set B relays are activated from Timing Relays L, M, N and O in the same manner as the first B relay is operated from Timing Relay K. Therefore, the number of power units in operation is a function of the number of Timing Relays, K, L, M, N or O which are energized.

Cycling Restrictions

Power units are started on as the switches in Step Controller No. 1 progressively close their contacts. In order to stabilize this control action and prevent cycling of the power units, the operation of the pneumatic motor driving Step Controller No. 1 is slowed. Specifically, the maximum travel rate of the pneumatic motor power shaft is such that a minimum of five minutes will elapse between the closing of successive switches. This means that during plant operation power units will not start at intervals of less than five minutes!

The slow action rate of Step Controller #1 is provided by a solenoid valve and restrictor located in the branch line from the positioner to the pneumatic motor (see again left side, Fig. 10). The solenoid valve is wired to a commonly used stoker timer which intermittently causes the valve to open and close. This provides an intermittent source of air to drive the pneumatic motor and, therefore, slows its action. At temperature controller branch line pressures of 8 psi and below, this slow action feature is eliminated by bypassing the solenoid valve and restrictor through the use of a pneumatic diverting relay.

The action rate of Step Controller #2 is slowed only slightly by a restrictor located in the temperature controller branch line to the positioner. This relatively fast action rate is necessary since the refrigeration load can quickly fall when the shopping center is closed after a day's operation. In this case, it is necessary to quickly drop out most of the operating power units, or else the plant will be shut down from a low pressure or low temperature refrigerant group safety control.

A surge tank is located in the branch line off the temperature controller. This serves the purpose of minimizing any surges or rapid changes in the branch line pressure which could have a detrimental affect on the power unit starting, stopping and speed regulating controls.

Control Coordination

Various portions of the automatic temperature control system have been described in detail as to their functions. However, individual action of each control or safety system is not singular in nature. Function of one results in the coordinated action of a number of these controls.

For example, assume that two power units are operating at a moderate speed to handle the refrigeration load. An increase in load will result in a higher water temperature and both power units will speed up accordingly. If the speed of the power units should become high and the refrigeration load is still not satisfied, then a third power unit will start. The speed of the two previously operating power units will then drop to the new speed at which the three units can handle the load. If, for some reason, the increase in refrigeration load is so great that three machines cannot handle it, then a fourth machine will start five minutes after the third unit has begun operation.

On a drop in refrigeration load, the speed of the power units will decrease. If the drop is sufficiently great, the minimum operating speed will be reached, and one or more of the power units will cease to operate. The remaining machines will balance out at an intermediate speed.

The throttling range and set point of Step Controller number one are such that a sufficient number of power units will be started to keep the balanced operating speed of the machines below their maximum permissible operating speed. In this case, the compressors will balance the refrigeration loads at speeds of 1500 rpm or less. And, as a group, they will only approach the maximum operating speed of 1800 rpm after all machines are operating at 1500 rpm if the refrigeration load is still not satisfied. This provision decreases the wear and tear on the power units and compressors, since high speed operation is kept to a minimum.

Sequence Changer

Equal running time for all machines is provided over a long period of time by manually turning off several of the power units during periods of low refrigeration load. In this case, the selector switches in the control sets, serving the first several power units to normally start under automatic operation, will be turned off. The temperature control system will then automatically bypass those machines and will start the following units instead. Thus, reasonably equal wear on all engines and compressors can be assured by competent operating practice.

A surer and more convenient method for obtaining equal running times is through the use of a sequence changer or transfer switch. This method is not utilized at Southdale; however, its use is so applicable to a control system serving multiple machines that it is shown in Fig. 10 and will be included in this discussion.

The sequence changer in Fig. 10 is shown interposed in the wiring between the contacts of timing relays K, L, M, N and O, and the holding coils of the B relays serving the control sets. The sequence changer is a handle operated type of drum controller functioning to vary the starting and stopping order of the power units for the purpose of equalizing wear on engines and compressors. For example, when the handle of the sequence changer is in the first position, the power units will start in the order 1, 2, 3, 4, 5 and will stop in reverse order. With the handle in the second position, the units will start in order 2, 3, 4, 5, 1 and will stop in reverse order. With handle

positions 3, 4 and 5, the power units will start in the following respective orders: 3, 4, 5, 1, 2; 4, 5, 1, 2, 3; and 5, 1, 2, 3, 4. The sixth position shown on the sequence changer would be for the extra compressor to be added at a future date. A weekly change in starting order would probably be advantageous for a system similar to Southdale's.

Master And Remote Control

The electric control circuits to step controllers numbers one and two are wired through the temperature control system master selector switch shown at left in Fig. 10. When this selector switch is in the "Off" position, the control circuits are dead, and the power units are off. The "Run" portion of the selector switch permits current to flow to the switches of the step controllers, which permits the power units to be started and stopped from the automatic temperature control system. The "Remote" position of the selector switch permits a push button station in the protection office to start or stop the machines through the automatic temperature control system (see right side, Fig. 10).

After the refrigeration plant is shut down for a few hours, the chilled water temperature will warm up to the point where the engine governor settings will be calling for full speed, and the step controllers will be calling for all power units to be in operation. However, Timing Relays K, L, M, N and O will have been de-energized through the "Off" position of the master selector switch or through the pushbutton in the protection office. When plant startup is desired, the master selector switch is turned to the Run position. Or, if it is already in the "Remote" position, then the pushbutton must be pressed in the protection office.

When this occurs, Timing Relay K is immediately energized and the first power unit starts cranking. Timing Relay L is wired through the time delay contacts of Relay K in addition to the switches of the step controllers, and Relay L is therefore not energized until two minutes after Relay K has been energized. Therefore, the second power unit is turned on two minutes after the first one has started cranking. Timing Relays M, N, and O are progressively energized after two minute intervals.

The starting sequence just described provides a minimum two minute interval between the successive startups of power units after a shutdown. After a prolonged period of shutdown during which the chilled water temperature will have risen appreciably, the power units will run at their maximum operating speed after the idling period has been terminated. When the refrigerated water temperature comes down to the design condition, the speed of the power units will decrease, and one or more of them will drop off the line.

Note that this automatic method for starting the machines provides a rapid pulldown when the water temperature is high. The only requirement for starting or stopping the entire refrigeration system is for one selector switch in the gas engine control panel or one pushbutton in the protection office to be used.

Engine Jacket Water System

The engine jacket water circulation system at Southdale is of special importance since it is used to help heat the shopping center during the winter and provides a source of heat for the domestic hot water during the entire year. Water cooled heat recovery silencers (see Fig. 11), or

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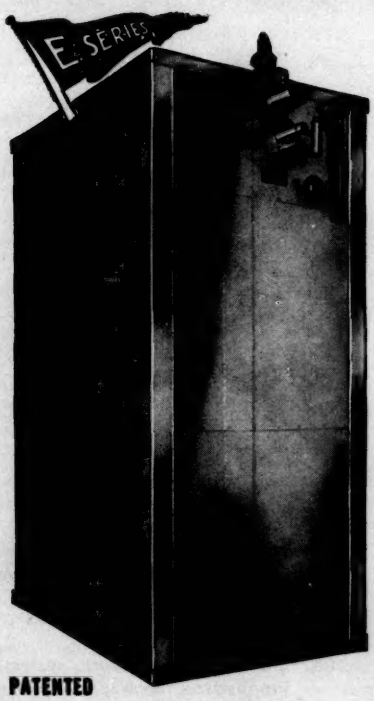

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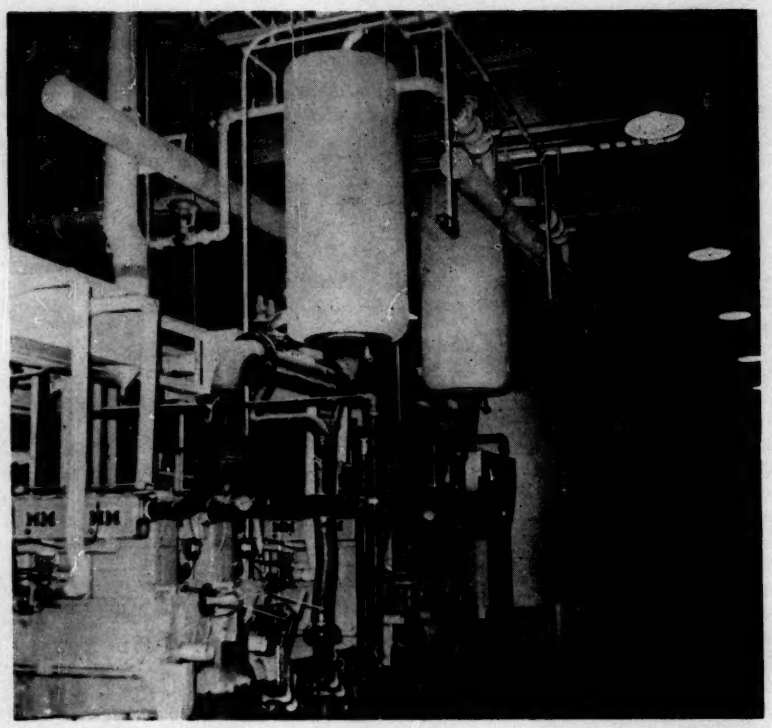

Fig. 11—View of two power unit exhaust manifolds and various piping arrangements. Jacket water leaving the engines is circulated through these special exhaust manifolds to pick up additional heat from the waste gases. This heat is then transferred to the condenser water and in the winter time used to heat portions of the Southdale Center. In the summer it is transferred to the waste water heat exchanger, the waste water being dumped to wells. Wells are used as a sink from which to extract heat as it may be required for heating purposes later on.

mufflers, are used in conjunction with the power units to increase the amount of heat from this source.

Fig. 12 shows schematically the equipment and piping arrangement of the jacket system. All five electric motor driven jacket pumps operate regardless of the number of power units running. Therefore, hot water is circulated through the engine jackets at all times, except during a complete plant shutdown. Advantages of this constant water circulation are less crankcase dilution, easier engine starting, and more uniform engine cooling after shutdown, with little opportunity for the formation of localized steam pockets within the jackets.

Each pump draws water through the two engine jackets of a power unit and then discharges this water through the water cooled muffler serving the same power unit. The water from all the mufflers enters a common discharge header and then proceeds in series to a domestic water heat exchanger, a condenser water heat exchanger, and a waste water heat exchanger. From there, the water enters a return header, where it is again drawn in parallel through all the engine jackets of the power units.

Jacket Water Pressure Control

Under such piping arrangements, water pressure control becomes critical. If the pressure in the engine jackets should rise much above 10 psi, there is a danger that some of

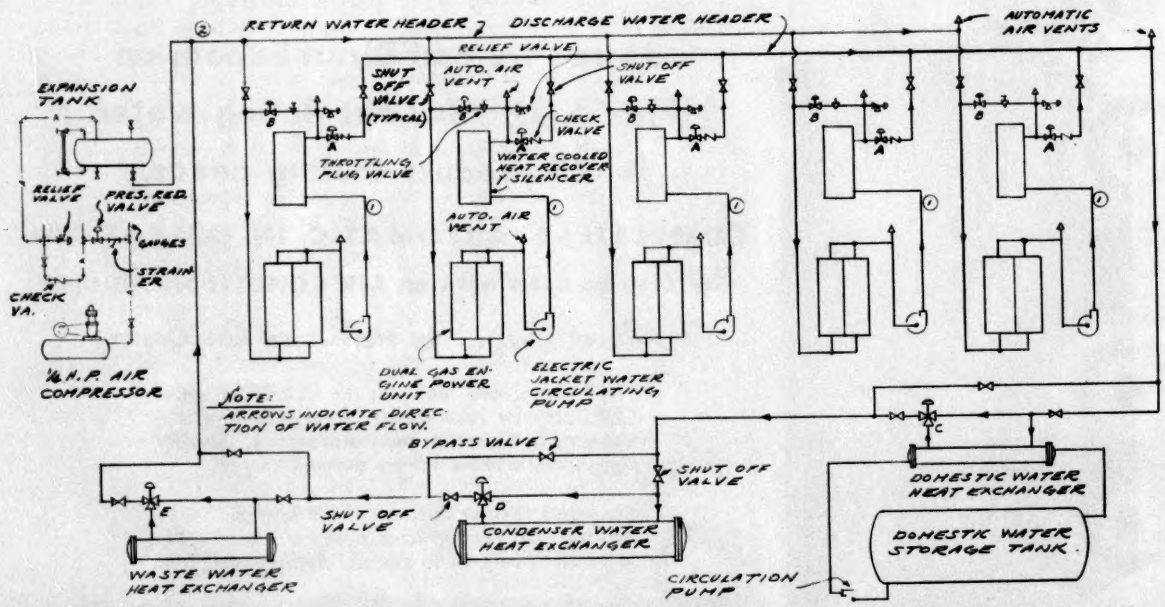

Fig. 12—Gas engine jacket water circulating system employed at Southdale. A closed, relatively low pressure, system is used. Head is maintained on the jacket water supply header by means of air pressure supplied to the expansion tank. The jacket water is used to heat domestic water as well as for heat pump purposes.

the jacket water gaskets can leak. For the Southdale system, the pressure in the return water header is controlled by the use of an expansion tank (see again Fig. 12).

It was thought best to maintain the return water header pressure at about 7 psi, and an open type of expansion tank would have required a water level over 16 feet above the header to maintain this condition. Sufficient head room for this purpose was not available. Therefore, a closed type of expansion tank, mounted closer to the floor, is utilized. A small air compressor unit feeds the top of the expansion tank through a pressure reducing valve. The reducing valve is set so that the return header pressure is the desired 7 psi. If, for any reason, the return header pressure should rise to 9 psi, a relief valve will discharge air from the top of the expansion tank to bring the return header pressure down to its desired value.

The water pressure drop through each power unit is approximately 5 psi. The water pressure at the suction of each jacket pump is about 2 psi, which satisfies the net positive suction head requirement of the pumps at the high jacket water temperature condition. Note that the return water header is pressurized low enough to prevent gasket leakage in the engines, but also high enough to prevent the pressure in any portion of the jacket system from falling to a vacuum. The jacket pumps discharge at a pressure of approximately 40 psi to provide circulation through the mufflers, heat exchangers, and their control valves.

Jacket Water Temperature Control

Jacket water feeding the engines is maintained at an average temperature of 180 F, and at this condition, the maximum water temperature off of the mufflers can approach 192 F. The temperature of the water feeding the jackets is sensed at Point 2 in Fig. 12 by the jacket water temperature controls.

Domestic hot water for most of the shopping center is maintained in a storage tank at a temperature between 135 degrees and 140 F. A small portion of the water from the storage tank is constantly recirculated by a pump to the tube side of the *domestic water heat exchanger*. The domestic water is heated by the jacket water flowing through the shell side of the heat exchanger. A temperature controller sensing the water temperature in the storage tank controls three way Mixing Valve C. This valve regulates the amount of jacket water to the heat exchanger as determined by the storage tank temperature.

In case the domestic hot water heating demand is greater than the heat produced by the engine jackets, a low limit temperature controller will prevent the jacket water temperature from falling below 175 F at Point 2 by overriding the storage tank temperature controller.

Three way Mixing Valves D and E are controlled in sequence by a temperature controller sensing the jacket water temperature at Point 2. On a rise in temperature from 181 to 185 F, Valve D will vary the jacket water flow through the *condenser water heat exchanger from* zero to full. On a fall in temperature from 179 to 175 F, Valve E will vary the jacket water flow through the *waste water heat exchanger* from full to zero.

During winter operation, it is desired to transfer the jacket heat not used for domestic water heating over to the condenser water. This will supplement the heat pump capacity and help heat the shopping center. At this time, Valve E will have been automatically closed, and valve D will

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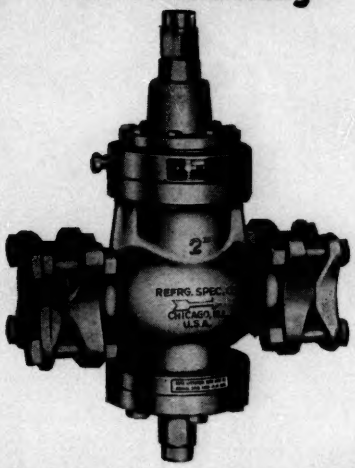

AVAILABLE CONNECTIONS ODS	FPT	Welding	Port Size	Tons @ 40° F. F-12	F-22	Ammonia
7/8, 1 1/8, 1 3/8	3/4, 1/2	3/4, 1/2	3/4	2.0	2.7	7.0
1 1/8, 1 3/8, 1 5/8	1	1	1	3.8	4.9	11.0
1 3/8, 1 5/8, 2 1/8	1 1/4	1 1/4	1 1/4	6.0	7.8	20.0
1 5/8, 2 1/8, 2 5/8	1 1/2, 2	1 1/2, 2	1 5/8	10.7	14.0	36.0
2 1/8, 2 5/8	2	2	2	17.4	24.0	50.0
2 5/8, 3 1/8	2 1/2	2 1/2	2 1/4	23.0	29.0	60.0
3 1/8, 3 5/8	3, 2 1/2	3	3	44.0	60.0	140.
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vary the jacket water flow through the Condenser Water Heat Exchanger to simultaneously transfer the jacket water heat and maintain the desired jacket water temperature at Point 2.

During summer operation it is desired to transfer the jacket heat to the waste water and not to the condenser water. Under this set of circumstances, Valve E will vary the jacket water flow through the Waste Water Heat Exchanger to maintain the correct water temperature at point 2. At this same time, Valve D will have shut off all water to the Condenser Water Heat Exchanger.

During intermediate seasons of the year, the quantity of waste water will not be sufficient at all times to cool the jackets. In this case, Valve E will be putting all the jacket water through the Waste Water Heat Exchanger, and Valve D will open just enough to put the excess jacket heat into the condenser water.

Water Regulating At Units

For normal operation, the "A" valves at the power units are wide open, and the "B" valves are closed. If for some reason a power unit is removed from the line and its jacket pump is stopped for a considerable period of time, the power unit and the jacket water within it will cool down. In such a case it would be harmful to restart the pump and let the hot jacket water from the remainder of the system flow immediately into the engine jackets of the power unit. For such a startup Valve A is closed, Valve B is opened, and the jacket water circulates from engine to muffler and back to engine. When this locally recirculated water warms up to 175 F, a temperature controller at point 1, causes Valve A to open and Valve B to close, and the jacket water again flows in parallel through all units.

Conclusions

Completely automatic control systems for gas engine driven refrigeration compressors are feasible and can be practical.

Success of such a system is dependent on the proper selection of gas engines and their auxiliary equipment. Conservative engine selection is advisable. Engine auxiliary equipment should be selected to give dependable service with a minimum of adjustments and servicing.

Dependable starting is the most important single function of the automatic system. Engine starting equipment must be arranged so that it will be effective after frequent, repeated starts and also after long periods of engine shutdown. No loads should be applied which will hinder an engine from immediately attaining its best firing speed during a cranking period.

Minimum wear on engines and compressors and increased equipment life should be one of the major goals of the automatic control system. Engines should not be immediately stopped after high speed operation. Consideration should be given to idle-start and idle-stop periods.

Properly designed engine jacket water circulation system can help in minimizing wear and tear on the equipment.

Cycling of machines should be avoided. Variable speed operation will help in this respect. For multiple engine applications, it is better to run a greater number of engines at medium speeds than a fewer number of engines at top speeds.

Safety controls for the gas engines, compressors and refrigeration system should immediately shut down the equipment for any dangerous operating condition.

Natural gas engines with magneto ignition are very suitable for automatic refrigeration compressor duty.

Most important of all, proper maintenance and inspections on the engines are an absolute necessity for their successful automatic operation. Knowledge of control systems and refrigeration plant, added to the internal combustion equipment requires a technical engineer, not a "sledge-hammer artisan".

NAPRE Divides Its Interests

Convention Featured Simultaneous Activities On Industrial Refrigeration and Air Conditioning

DOUBLES of everything seemed to be the convention rule this year for NAPRE. First the Association engaged two hotels to provide accommodations for members and for the meetings. Dual educational sessions were held, one session featuring industrial refrigeration topics, while the other simultaneous session dealt with central station air conditioning subjects.

The Association also held its traditional educational exhibits, even though the 10th Exposition of the Air Conditioning and Refrigerating Industry was running at the same time. NAPRE also featured two field trips daily and as an extra or very special educational feature, arranged for instruction of its members in the Fruit Growers Express Co. FGEX-1600 mechanically refrigerated railroad car. A parallel activity to the instruction car were trips to the Museum of Science and Industry, only a few blocks away from the convention headquarters.

The Association even split its traditional breakfast session activities this year. In addition to the annual membership awards, new industrial members of the Association were presented with their membership certificates, and previous members in attendance were also singled out. Even one of the socials was divided. On Wednesday evening, November 20, the ladies enjoyed a card party, while the gentlemen attendants made a trip to the Atlas Prager Brewery.

Socially, there was just enough play on the part of the convention registrants to offset a very heavy educational and a bit lighter business agenda. The traditional informal buffet was held on Monday evening, Tuesday evening was open, and on Thursday night NAPRE held the usual officers' reception, installation, dinner, followed by dancing. The ladies present made a trip to the Chicago Art Institute to see the Picasso Exhibit on Monday, November 18. Illinois Bell Telephone Company sponsored a program on Tuesday, and on Wednesday, in addition to the card party, the ladies visited the Kungsholm Puppet Opera for a rendition of "La Boheme".

Opening Activities

The 48th Annual Meeting was convened at 9:30 a.m. on Monday, November 18. NAPRE President Bert C. McKenna presided. Following an invocation by the Reverend Edward V. Cardinal, Pastor of St. Viator's Church, Chicago, a welcome address was delivered by the Honorable Carl A. Schroeder, Postmaster of Chicago. Father Cardinal was introduced by Nicholas M. Downes, Past President of Chicago Chapter, who was Convention Chairman. Downes pointed out

the extensive educational background and accomplishments of the priest. The delegates learned that Father Cardinal and Postmaster Schroeder had served together on many youth and educational groups in the City of Chicago.

The Honorable Postmaster related how he had became acquainted with NAPRE and its activities. He pointed out that refrigeration wasn't exactly alien to the Postoffice Department, having been employed for a number of years in the larger postal department buildings for cooling drinking water and providing refrigeration to concessionaires. Recently, however, air conditioning has been authorized for certain work areas in the post offices where operating conditions have been less tenable. With the addition of air conditioning plants more refrigeration responsibility was placed on the building engineers. Most of these engineers had no experience with refrigeration or air conditioning so they turned to NAPRE for help.

However, the principal point in the Postmaster's address was not the passing of orchids in the direction of NAPRE. The point the Postmaster made was the fact that in the nation's youth of today lies the future of America. Postmaster Schroeder has practically spent his entire life time in the interest of youth and youth organizations. He pointed out that a practical organization like NAPRE should encourage its members to take a more practical point of view toward youth activities in their own community. Taking a paragraph from a talk of a few years back by the late Professor H. G. Venemann, the Postmaster pointed out that the average engineer in this field does not do too much toward community work. He cited the Professor's example of many nights at home in front of the TV, listening to the radio, pre-occupation with a home hobby. He urged the NAPRE members to get out and spend at least one evening a week in connection with a youth activity.

Nicholas M. Downes

Hon. Carl A. Schroeder

Rev. Edward V. Cardinal

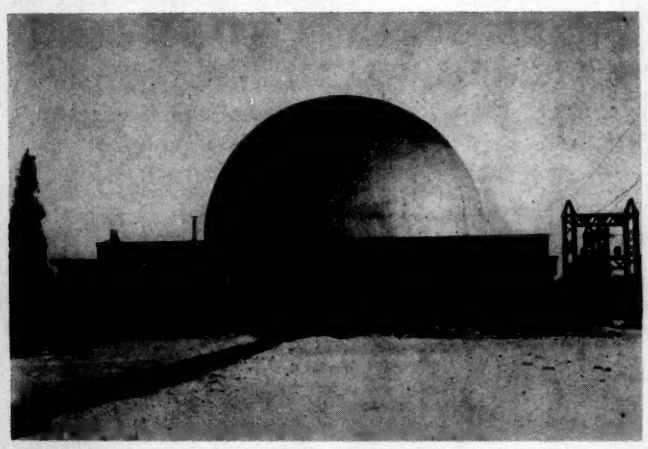
Jay R. Watson

Postmaster Schroeder extended a hearty welcome to all convention delegates, their wives and visitors. He pointed out some of the feature attractions which the Chicago area offered, on the list of which was the postoffice building itself. The Chicago postoffice is the largest single postoffice building in the United States and in addition is the gateway for most of the East-West postal traffic. The Postmaster showed an intimate knowledge of some of the practical engineer's problems other than the refrigerating field, when he pointed out that many of them were getting better acquainted today with materials handling equipment. He invited the engineers to visit the Chicago Postoffice and to inspect first-hand the conveyors and mass mail moving equipment. He thought they would get a few ideas from it for their own establishments.

Honorary member Jay R. Watson, NAPRE, replied to the Postmaster's address. Watson, who was secretary of the Chicago Chapter of NAPRE for over ten years, and a member for over 35 years, thanked the Postmaster in behalf of the delegates present for his welcome. He, too, drew on his own personal experiences with NAPRE and pointed out how well the organization had helped him in his many years of activity. Watson urged that NAPRE drop its modesty and let the refrigeration industry know the facts concerning the job which it is doing in the practical field.

Continue Four-Year Plans

Following this presentation, the Association opened its first business session with reports from the officers and committee chairmen. Business accomplishments of the Association included ratification of an amendment to the by-laws, raising the annual dues to $10.00; chartering of new chapters at Spokane, Wash., Bakersfield, Calif., Jackson, Miss., Benton Harbor, Mich., and New York City. The 4-year program adopted in 1956 was reviewed,



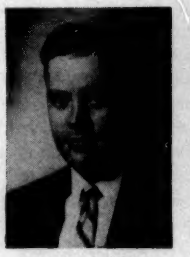
Entrance to the 5,000 KW Experimental Boiling Water Reactor recently placed in operation by the U.S. Atomic Energy Commission at Argonne National Laboratory, Lemont, Ill. The Laboratory is operated by the University of Chicago. This was the feature field trip of both NAPRE and ASRE Conventions held at Chicago in November.

Carl Sandburg, poet and most active unofficial member of Chicago's Chamber of Commerce, visited the Museum of Science and Industry and in particular the telephone exhibit during the recent NAPRE and ASRE Meetings in that city. He is pictured here talking to Major Lenox Lohr, Museum Head. Photo Courtesy of Illinois Bell Telephone.

NEW INDUSTRIAL MEMBERS OF THE NAPRE

A. A. Silverman
President, Vilter Manufacturing Co.

H. B. Howe
President, Howe Ice Machine Co.



W. E. Kahlert
Vice-President, Baltimore Air Coil Co.

Hal Jarvis
Promotion Manager, Recold Corporation

progress of the year 1957 was determined and slight modifications made to the 4-year plan for the 1958 activities. The Association's Board of Directors announced their selection of the convention site for 1958, accepting the invitation of Greater Dade County (Miami Beach) Chapter.

Feature of the business sessions this year were three chapter clinics. At these conferences, three association officers or committee chairmen made up a panel which presented facts, proposals or suggestions pertaining to association publications, chapter educational programs and membership.

Chapter Clinics Popular

Delegates participated to a considerable degree under the leadership of the clinic chairmen. Consensus was that delegates derived a great deal of administrative experience and "know-how" which they could take back and apply to their chapters.

Summaries of the educational presentation appears on this page. A review of the traditional breakfast session at which the new industrial members were introduced, is included in "From the President's Desk" page 28. Principals of four of the firms participating as Industrial Members were present.

The masthead for the Practical Refrigeration Engineer section which appears alongside the President's message, carries the list of new officers for NAPRE. Biographical sketches of the officers and their previous activity in NAPRE will be a feature of the President's January message.

Summaries of Papers Presented at NAPRE Meet

Erich B. Utescher

John J. Bryner

William Lorenz

Hotel Air Conditioning A Feature Conference For The Industry

LEAD OFF FEATURE for the first educational session at the 48th Annual NAPRE Meeting was the air conditioning conference which featured a panel discussion on problems of hotel air conditioning. Chairman of the panel was J. E. Scally, Vice-President for Engineering, Alsonett Hotels, Tulsa, Okla. Members of the panel were Erich B. Utescher, Supervising Engineer, Kirkeby Hotels, New York City; John J. Bryner, Chief Engineer, Roosevelt and New Orleans Hotels, New Orleans; C. C. Larsen, Construction Superintendent, Sheraton Hotels Corporation, Boston, and William Lorenz, Chief Engineer, Schimmel Hotels, Lincoln, Nebraska.

Hotel Air Conditioning — A Must

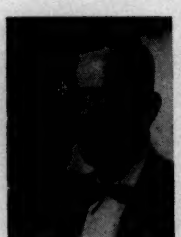
Utescher led off the discussions with a statement concerning the importance of air conditioning to the hotel business and followed it up with a discussion of the advantages to be found in central station air conditioning. John Bryner discussed low pressure and high pressure double duct air conditioning. Larsen tackled the topic of hotel air conditioning installation costs, and Lorenz presented specific problems encountered with individual controls on central system air conditioning. He also presented specific problems with water condensing and the variations of these problems from location to location. John N. Mariakis, Chief Engr. Claiborne-Towers Hotel, New Orleans, was the NAPRE officer in-charge of the session.

Daniel D. Wile

Proper Refrigeration Increases Meat Profits

DANIEL D. WILE and HOWARD A. HALLS
Recold Corporation, Los Angeles, Calif.

There appears little justification for the use of brine spray systems in carcass coolers. The high operating cost and excessive maintenance cannot be justified in view of the superior results obtainable with other type systems. Intensive investigations have developed convincing proof that certain refrigerating practices have a pronounced effect on quality and on shrinkage. Careful attention to refrigeration design and operating practices will increase profits through non-shrinkage and non-spoilage savings.



J. Engalitcheff, Jr.

Water Conservation Equipment, Theory and Application[3]

JOHN ENGALITCHEFF, Jr., President,
Baltimore Aircoil Company, Inc.

Description of principles of different methods of water conservation for air conditioning and refrigeration, and discussion of their relative merits. Discussion of Basic Methods of installation for different types of water conservation equipment as well as discussion of their capacity control. Metal finishes were discussed as well as the use of dissimilar metals in construction of cooling water equipment. A new evaporative condenser engineer's manual was introduced.

[3]Copies of this paper are available to chapter program chairmen and instructors at present. The engineer manual will be circulated to the entire NAPRE membership as a part of the educational program in 1958.

Ammonia Recirculation In a Small Meat Freezer

Joseph Greenspan

JOSEPH GREENSPAN, Chief Engineer
Frigidmeats, Inc., Chicago, Ill.

Freezer Industries, Inc., renovated a brewery building for Frigidmeats, Inc., a prominent frozen meat processor, installing the necessary cooler, blast freezing and freezer holding space. Refrigeration equipment initially installed used a two-stage direct expansion and flooded ammonia system. At a later date, this system was converted to liquid recirculating with increased freezing capacity and lowered temperatures. Some of the problems encountered in changing over and operating the revised system were discussed.

Multi-Stage Refrigeration

W. F. Stoecker

W. F. STOECKER, Assistant Professor Mechanical Engineering Department, University of Illinois

Multi-stage systems provide better economy and performance in many refrigeration plants. There are numerous variations in the arrangements, but all can be analyzed by setting up heat and flow balances. The unique features of a multi-stage system, which contributes to the improved efficiency, are flash-gas removal and intercooling. These processes can be understood most clearly by considering them separately. Plotting the processes of a multi-stage system on the Mollier or pressure-enthalpy diagram gives a further visualization of these processes.

Howard A. Wolfberg

Controls for Automatic Heat Pump Installations

HOWARD A. WOLFBERG
York Corporation, Subsidiary Borg-Warner Corporation, Chicago.

Introduced in the November issue of *Industrial Refrigeration* as "Controls at Southdale", Wolfberg presented an informal discussion of the first portion of his work and previewed the second portion which appears on page 30 of this issue. The author emphasizes the need for operating and maintenance personnel to upgrade themselves to the practical technician's level. The presentation at the 48th NAPRE meeting permitted more detailed discussion of the systems.

Guy R. King

Refrigeration's Role in The U.S.

GUY R. KING, Instructor
Santa Monica City College

What is the biggest single use of refrigeration? Is it air conditioning? Is it the chemical industries? Is it stratosphere test chambers? Our greatest use of refrigeration is none of these. The greatest use of refrigeration is for the preservation of food products. Using large area maps of the United States, the author showed points of origin for fruits, nuts and produce, as compared with the population centers. The preservation of foods from the point of origin to ultimate consumption involves staggering tons of refrigeration. Conclusion drawn by the attendants was that food preservation refrigeration may not be as popular as air conditioning, but it is still the giant of refrigerating applications.

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A DIVISION OF AMERICAN-MARIETTA COMPANY
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Centrifugal Compressor Application To A Fully Automatic Refrigeration Plant

ROBERT F. MCKEE, Mech. Engineer
Pacific Fruit Express Co., San Francisco

Robert F. McKee

Dealt with the application of centrifugal compressors to a fully automatic refrigeration plant, including the problems of safety controls and their arrangement, instrumentation of the centrifugal type machine, automatic loading in correlation with the refrigeration on demand, and some of the practical aspects of operation of centrifugals. After that discussion the audience took a trip to Ogden and visited the Pacific Fruit Express Co.'s ice plant. Diagrams of the piping and flow system, and wiring diagrams were shown. Essential features of the Ogden plant included 4 centrifugals, each 285 T.R. with 450 hp motors, cooling sodium chloride brine for the ice tanks and storage refrigeration. The plant has 6400 cans and is now rated at 720 tons daily output. There are several interesting innovations such as no can covers, no insulation under the tanks, radiant heating, etc.

Industrial Insulation of Piping and Vessels

JOHN C. TYLER, JR., Sales Manager
MMM, Inc., Portsmouth, Ohio

John C. Tyler, Jr.

Development out of the chemist's test tube of mineral forms of insulating material were reviewed. Other than to mention that the uses of board forms for building construction, these uses were omitted and the discussion centered on the use of new materials for piping and pressure vessels. Thermo-conductivities of the various materials were discussed and compared as well as thickness for practical use. Common misapplications were cited and recommendations were made for vapor sealing and protecting insulation against mechanical damage. Light weight, stability, and low K factor were emphasized as design qualities. Proper application in the field and inspection for service qualities were emphasized as the practical engineer's responsibility.

Refrigeration and Air Conditioning Applications in the Pharmacal Plant—Water Problems[4]

PAUL V. NORTHAM, Chief Engineer
Miles Laboratories, Elkhart, Ind.

Paul V. Northam

Described the physical plant, touching on the rapid growth and expansion of Miles Laboratories, Inc. Pointed out the several types or methods of air conditioning in use and some of the problems involved in air conditioning a pharmaceutical plant. Mentioned the current expansion of air conditioning equipment in office and laboratory areas. Discussed the firms water supply, problems of disposal and consumption, tracing its current problem from the original water supply arrangements through to the present time.

[4]This paper is a more up to date presentation of the original by the same author which appeared in the 1955 NAPRE Operating Data Book.

"Shootin' Service" on Thermostatic Expansion Valves

W. H. KRACK, Sales Manager
Sporlan Valve Co., St. Louis, Mo.

W. H. Krack

Operating engineers, contractors, and servicemen working with ammonia systems are sometimes confronted with service problems that require a good working knowledge of the thermostatic valve and it's function on a refrigeration system. However, when the valve is properly selected and installed, the probability of trouble from this source is reduced. The operation of the valve is greatly affected by many other factors throughout the entire system such as good piping layout, design, and the application of the correctly sized valve for the job. It is important that all of these aspects be thoroughly understood. "Shootin' Service"[2], a colored slide presentation, covered all of these points.

[2]This talk, "Shootin' Service", is now available for presentation to local NAPRE Chapters throughout the country by contacting the National NAPRE Educational Committee.

Humidity and Its Control[5]

NORMAN SHARPE,

Head Air Conditioning & Refrigeration Dept., California State Polytechnic College

The author presented mechanical picture of heat and moisture transfer showing what must be done to control humidity in spaces either above or below 32°F. The problem of humidity control was divided in two parts: the moisture given up by produce within the cooled space, and the moisture removed by the cooling coils. A definition was given of absolute humidity together with a table and a chart on the moisture holding capacity of air. Relative humidity was then defined. Specific humidity or humidity ratio were discussed, as well as the specific enthalpy of moist air.

[5]Copies of this paper are available to chapter program chairmen and instructors at present.

[3]All papers presented at 48th Annual Meeting, NAPRE, except as specifically noted here, will be reproduced in *Industrial Refrigeration* early in 1958.

Another Hoosier Industry, Piping Enterprises, Inc.

CENTRAL Indiana acquired another refrigeration contracting and service industry early in June. Organized at that time, Piping Enterprises, Inc., announced their incorporation on August 15, 1957. The firm will specialize in heating, ventilating, power, process, plumbing and water treatment systems in the large commercial and industrial field. Refrigeration and air conditioning systems will be a specialty.

The firm has already been designated as distributors of equipment for the Vilter Manufacturing Company of Milwaukee, Wis. Their franchise territory is Central Indiana. The firm also represents the Metropolitan Refining Company in New York in the water treatment service field. Their territory for the latter firm includes Indiana, Michigan and Kentucky.

First vice-president of the firm, Donald C. Fulk, is a member of the Venemann Chapter, NAPRE (Indianapolis). Fulk is a graduate of Purdue and one of the late Professor Venemann's students. He is a registered professional engineer in Indiana and has been active in the chartering of that Indiana Chapter of NAPRE.

Fulk has had seven years experience in the ammonia and "Freon" field. Other members of the firm have had from 10 to 35 years experience in the mechanical contracting field. The firm will make its headquarters at 6560 North Tremont, Indianapolis 8, Indiana.

NAPRE

Question Box

The National Educational Committee, NAPRE, answers monthly in this column, operating problems forwarded by members. The Committee appreciates answers from the field. Address questions and answers to Prof. Harold P. Hayes, Dean of Engineering, State Polytechnic College, San Luis Obispo, Calif.

Identity and Correction Asked for Slime Control

QUESTION NO. 1209: Gelatine like substance forms on air conditioning evaporator or builds up on drip pans located beneath evaporators in a hospital installation. The individual room coolers have a central (gravity) drip collecting system. This same substance clogs up the drip pipes.

Discussion at our NAPRE meetings brought out a presumption that the substance is an algae. Consensus was the treatment should consist of a hyperchloride solution which should destroy the algae. It was further agreed that the substance, if it is an algae should be completely destroyed and disposed of to avoid regrowth. Apparently this method becomes immune to some treatments and rebuilds...

Even after discussion of the chapter there is some uncertainty as to whether our guess-work is correct. Is there any printed literature or material available which would describe algae for us in order to compare it with our Gelatine substance? Are there any rather standardized treatments that could be described?—J. R. T., Jackson, Miss.

ANSWER No. 1: Substance described by JRT is probably a growth of slime bacteria. It is the same sort of growth that plugged up the drain of the old reliable ice refrigerator when it was neglected.

Algae are plantlike growths requiring light, but the dirty, colorless slimes are bacterial in nature, and can thrive in the absence of light. In a circulating system, such as condenser cooling, the growths can generally be controlled by periodic treatment at regular intervals with a slug of chlorine or hypochlorite solution.

A drip collecting system presents a different condition. As far as I know, there is no substitute for periodic manual flushing of such a system. For most effective cleaning, the evaporator surfaces and drain lines should be flushed with a fairly strong solution of Clorox, or other commercial hypochlorite material, after the bulk of the slime has been flushed away. Such treatment will not prevent recurrence of the growth, and the system should be inspected regularly to determine how frequently cleaning is needed. —KMH, St. Louis, Mo.

ANSWER No. 2: If the growth you described is green or blue-green in color it is algae. If the color is gray, tan or brown, it is most likely to be slime forming bacteria. In either case treatment with hypochlorite should kill the living matter, but not necessarily remove the resulting dead material. Regrowth could be expected in a few days or weeks after treatment is stopped due to reinfection or incomplete kill.

An excellent reference work is "Fresh Water Algae of the United States" by G. M. Smith (McGraw-Hill). Positive identification would require a medium power microscope. A qualified water treatment company could determine the kind of living matter and thus advise the best method of control, if the hypochlorite is not satisfactory.—P.G.B., Chicago, Ill.

Wants "Why" Behind Certain A/C Suction Piping Practice

QUESTION NO. 1210: Why do some manufacturers put goose necks a few inches downstream of the thermal bulb on air conditioning coils?—G. B., Augusta.

ANSWER: The purpose of the thermal bulb is to "read" the gas temperature and relay that information to the expansion valve. It is therefore important that the bulb "read" gas temperature and not the temperature of trapped oil or liquid. Con-

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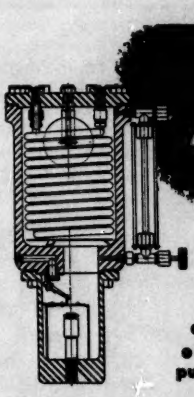

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sequently a goose neck is frequently used to make sure that oil and liquid are drained away by gravity and do not back up to the thermal bulb location.—H. P. Hayes.

Locate Best Charging Point

QUESTION NO. 1211: In some plants it is the practice to charge liquid ammonia direct into the main suction connection to the compressor while others charge through some portion of the evaporative system. Which is the better system?—E. E. C., Australia.

ANSWER: I do not think it makes too much difference provided you are properly careful. The important thing is to keep from slugging the compressor with liquid. The valve on the refrigerant drum acts as an expansion valve and throttles the liquid refrigerant from a high pressure liquid to a mixture of gas and liquid. The farther this liquid is from the compressor, the less chance it has of slugging. However, with proper patience and care, it can be fed directly to the suction line with safety.—H. P. Hayes.

(Editor's Note: In large industrial plants many engineers charge liquid refrigerant directly to a low pressure receiver in the system. In this manner they "work the liquor"—meaning that they use it for heat removal and vaporize the charge by useful work.—J. R. K.)

High and Low Voltage Effect On Motors, Plant Efficiency

QUESTION NO. 1212: What effect does high voltage have on the cost of electric current in a plant, say the plant is designed for 440 volts and that the voltage runs 480 to 490; also what effect will low voltage have?—E. D., Memphis.

ANSWER No. 1: The analysis of this question can be complicated because it depends upon a number of assumptions. I like to use the basic rule of thumb: For a given load, the lowest line voltage that will carry the motors at design speed is most economical.

For a given load, the higher the voltage the lower the required current. Thus the reactance increases and the power factor drops. This usually increases power costs.

On the other hand, if motors are overloaded and tending to slow down, the efficiency may begin to drop. Higher voltage will bring them up to speed and possibly increase the efficiency but power factor will drop. You are, therefore, choosing between the economy of motor efficiency and the change in power factor.—H. P. Hayes.

ANSWER No 2: From a practical point of view rotating equipment will give much better performance when operating at a system voltage somewhat higher than the nameplate rating. The following listed advantages will be evident.

a) If the voltage is a little high when coming into a building, this will allow a safety factor for a line drop so that the voltage will be closer to rated when it gets to the motor.

b) If the voltage at the motor is a little higher than nameplate, for a given horsepower output, the running current will be considerably less; therefore the motor will run cooler and will be able to carry a little bit greater overload.

c) When the voltage is a little high the amount of current which feeder wiring must carry in order to deliver required horespower will be reduced so that you get greater current carrying capacity out of existing wiring.

If the voltage should be lower than normal, then the above things all work in reverse in that the motor will run a little hotter, will not be able to carry as great an overload, and there will be a tendency to add an unnecessary load on all power feeder wiring.

Other electrical devices which will be affected in a plant because of high volt are lighting, solenoid operating coils and various types of resistance heaters. With all of these, the higher the voltage the higher the amount of power they will consume and the more current will go through the device. Light bulbs will give off more light but will have a shorter life. Operating coils will have greater operating strength but could conceivably have slightly reduced life, due to the extra amperes going through the coil and causing it to run a little hotter than usual. Resistance devices will give off considerably more heat.

All electrical devices are built with a safety factor so that they can be operated at least 10 percent over nominal voltage and also 10 percent below nominal rated voltage. For this reason operation in either of these directions should be satisfactory. However, the performance will be better if the line voltage is a little bit on the high side.—W.L.T., Chicago, Ill.

(Editor's Note: NAPRE has a data sheet No. 2000 published by a leading manufacturer of electric motors which gives exactly the effect which high and low volt would have on motors and plant efficiency.

How Molecular Weights Bear On Compressor Design, Uses

QUESTION NO. 1213: In October IR, page 13, there is a footnote which refers to NH_3 having a molecular weight of 17. Discussion at our chapter meeting showed that many of us did not understand why higher molecular weight had any bearing on the article. Could you answer this "why" in a few paragraphs in the Question Box? We think other chapters (and members) may not have understood the importance of that 17.—W. L. T., Chicago.

ANSWER: The head developed by a centrifugal compressor depends upon the speed of the blades (tip speed). The higher the tip speed, the higher the head developed. But

Pressure = Head × Density

and the density of a gas increases in direct proportion to its molecular weight (with all other factors held constant).

Therefore, for a given tip speed it is much easier to produce a given pressure with gases of high molecular weight than with those of low molecular weight.—H. Hayes.

(Editorial Note: For "why" in greater detail refer to H. W. Shedd's article "The Centrifugal Compression of Ammonia", Operating Data Book, and "New Refrigerants — Their Characteristics, Identity and Applications" by Guy R. King, 1957, Operating Data Book).

NH_3 Boil At Minus 28 F?

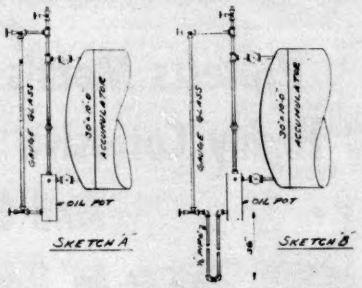
QUESTION NO. 1214: What is the temperature of liquid ammonia at sea level when held in an open container? Why is it at minus 42 F?—Q. M., NYC.

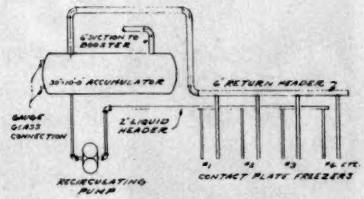
ANSWER: The temperature of liquid ammonia at sea level, when held in an open container is minus 28 F. If you are getting an accurate reading of liquid ammonia at minus 42 F, you must be taking the reading at a point where the pressure is only 10.4 psia.—H. P. Hayes.

New Questions

Corrects Gage Glass Surges But Wants "Why" of Remedy

QUESTION No. 1215: Sketch "A" is of a well known oil pot type ammonia liquid level gage connected to an accumulator operating under 5 to 7 in., vac., suction pressure. The accumulator and pipe lines are covered with cork insulation; the oil pot and gage are not.





The accumulator is used with a battery of contact plate freezers and employing a recirculating pump. Piping connections are shown in Sketch "C".

Experience with this gage glass has been surging of oil and ammonia in the form of foam in the glass followed by loss of oil from the pot. Surging takes place at very erratic intervals varying from minutes to hours to days between surges. There has never been any unusual operation as far as refrigeration load and compressor operation is concerned. When we say unusual we mean other than normal operation for this particular plant.

To be sure of no unequal pressure conditions in gage assembly, all pipe connections and valves to accumulator were examined for obstructions, ball check and pins were removed from gage glass valves and rubber gaskets of gage glass were examined to make sure they were not causing obstructions at ends of glass. All this had no effect in reducing surging.

In an effort to overcome this surging condition, several things were tried with no success. The one thing that did prove quite successful was as shown in sketch "B", the installation of a 36-in. loop of 1/2-in. pipe at the lower gage glass valve. This system has been operating quite successfully for several months with surging eliminated. During this time all operation conditions were the same as before.

a)What caused this surging in the first place?

b) How and why did the installation of the loop as shown in Sketch "B" overcome the surging?—S.M.R., So. Pa.

Are Back Pressure Controls Same For All Refrigerants?

QUESTION No. 1216: I have noticed that several manufacturers of refrigerating equipment do not make equipment for both ammonia and the "Freons". One of these items is the back pressure regulator. Are the characteristics and nomenclature the same in the valve for both refrigerants? Does the stem at the bottom of the valve work the same way for both refrigerants? Can you supply me with the makers of the EPR for Refrigerant-12?—A.E.C., Los Angeles.

Insulation Inquiry

QUESTION No. 1217: What is Gilsonite? Is it the same as Gilsulate? Could it be used for refrigeration insulation?—J.P.W., Chicago.

When To Air Condition

QUESTION No. 1218: How do you know when a building needs to be air conditioned? Are there any specific temperatures and humidities which clearly indicate that air conditioning is needed? For example, would air conditioning be recommended for a clothing store which is at 85° F d.b. and 52% r.h. many days of the year?—R.G., St. Louis, Mo.

Stumped By Trade Jargon

QUESSION No. 1219: Would you explain what is meant by the term "Coil by-pass factor"?—C.M., GDC, Fla.

Why The Difference In Psychrometric Charts?

QUESTION No. 1220: I have recently changed jobs from plant refrigeration to air conditioning installation. In studying psychrometric charts, I notice that many different companies print charts and they are slightly different from each other. Are the differences big enough to worry about? On an actual job would it make much difference which chart I used?—G.B., NYC.

Burns Encourages New Chapters

CHICAGO—As members of NAPRE, we pride ourselves in the phenomenal results of our membership drive, in the growth of our organization, and the many new chapters that have been granted charters.

From what I can see as Vice-president, there are many more localities just about ready to apply for charters. You, the members-at-large, are greatly responsible for the new chapters. You are the men who prove to others what our organization can give. You have been the inspiration to other men to get together a group large enough to formulate a chapter. That is where friendship and the opportunity for better knowledge of the field of refrigeration begins.

So, once more I repeat to you, our members-at-large: form a chapter. There are many operators just waiting for the invitation to be extended or the question to be asked by you about membership and forming a chapter . . . and you have the inspiration to pass on to them.

As my term in serving you draws to a close, I want to thank each member for the kind and helpful letters you have written to me, and hope that you have received a great deal of satisfaction from those appearing in our official organ.

As the time of year has arrived when we again pay our dues for another year, may I suggest that we enclose a small contribution for the Venemann Memorial Educational Fund . . . to start a young

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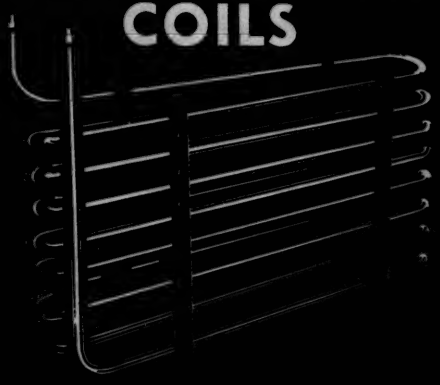

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fellow on his way. Acts of this kind promote good-will and help make an organization such as ours successful. If we would have had an opportunity such as is now being offered by NAPRE when we got our start, it would have helped.

As a reminder, don't forget dues must be paid by January 1, 1958, according to the new ruling, in order to keep your magazine and other information coming without lapse.

Early Birds With Dues

Two members-at-large, from widely diverged places on this globe, shocked the national office recently by sending in their 1958 dues almost five months before they were expected. From all indications it took several days for the national office staff to snap themselves out of this state of disbelief. The two members responsible for the welcome but startling event were M. S. Rack in the Office of the Fisheries Adviser, Game Department, Lusaka, North Rhodesia, Africa. The other was F. G. Minister of the F. C. Lovelock Pty. Ltd. of Sydney, Australia. Rack noted in his correspondence that he would be in Grimsby, Lincolnshire, England, from September through February 1958.—Roy Burns.

Social Times at St. Louis

ST. LOUIS— With NAPRE members, their wives and families, St. Loius Chapter opened their 1957-58 season. On September 21, the annual Bar-B-Q was held which was a tremendous success. Many prizes were donated by the members. There was Bar-B-Q with all the trimmings and a special treat of candied applies, donated by one of the associated members, for the children.

The new offlcers Peter S. Orlando, President, Donley Pipe & Supply Co.; Wilson Hannebrink, Vice-president, Merchants Refrigeration; C. R. Johnson, Treasurer, Falstaff Brewing Corp.; Ed Hughes, Secretary, Millstadt (Illinois) Creamery Co.; and Lester Lanser, Sgt.-at-Arms, Pevely Dairy Company, were introduced at this affair held annually—the coming-out party for the new officers.

On September 27, the members and their wives were guests of the Falstaff Brewing Corp., Plant No. 5, who graciously arranged a very fine tour of their complete brewery, showing the new innovations and equipment which have been installed recently. After the tour we had a very pleasant time, with refreshments furnished naturally, by "Falstaff".—Peter Orlando.

Susquehanna Natives to Open Fall Program

LANCASTER – Southeastern Pennsylvania Chapter, NAPRE, is well on its way to 300 percent increase in membership since first organization meeting in March. First meeting of the chapter in September was the start of the Guy R. King course, Basic Refrigeration. The speaker program covered expansion valves.

Second meeting in September was first meeting of the fall series (the first September meeting being the conclusion of the summer session). This was in the way of a social meeting with friends and guests invited. The main feature of this meeting was a color film entitled "Gift from the Earth—Natural Gas".

This feature was sponsored by the Transcontinental Gas Pipe Line Corp. The color film explained and followed the geologist in his quest for natural gas, the drilling of the wells and gathering for the main 36 in. pipe line. The film took the viewers to the steel mills for the pouring and rolling of steel, followed by welding of the pipe, the coating with a rust preventative and the loading for distribution to the field.

At this point large "cats" were making the ditch for a 36 in. line. Bending, joining and welding together of the many lengths to form a single steel tube 1700 miles long, was shown next. Over hill and dale, rivers and highways the common carrier was laid.

The operation in the compressor stations was then shown which stations are placed every 50 to 80 miles for boosting the pressure to keep the gas moving along this great length of tube. Following the film refreshments were served.

Our first meeting in October saw the continuation of instruction on expansion valves. Guest speaker was T. H. Silary of the Sporlan Valve Co., Philadelphia office. Silary conducted the instruction program with black-board and slides as visual aids.—Milt. Rambo.

Postman's Holiday For Illinois Chapter

CHICAGO—Members of the Chicago Chapter literally took a postman's holiday on September 10, when they opened their Fall season with a tour of Chicago's main postoffice and annexes. Said to be the world's largest postoffice, the building is efficiently operated by Chicago Chapter President, Eugene Kelly, chief engineer. The group met in the spacious lobby where they were greeted by Kelly and two of his assistants, and were then taken to the canteen where coffee and doughnuts were served, compliments of the concessionaire. The educational class was postponed until the next meeting because of the busy schedule planned for the evening.

Kelly introduced some of the personnel from the various postoffice departments and the assistant building superintendent gave NAPRE members a warm welcome followed by a brief discourse on the building. He stated that the building contains 47 million cubic feet and told of the many materials used in the construction. Trip attendants were informed that all the steam is purchased from the Union Station. He explained the postoffice operations and brought out the fact that the Chicago postoffice was the first in the country to have helicopter service. He went on to give a few statistics, such as, the postoffice has ten miles of conveyors, 20 miles of belting, 50 electric tractors of various types for handling mail, 4500 hand trucks and 100 cancelling machines.

At that point Kelly's department took over once again and the tourists were taken to 3 of the 18 fan rooms, where they inspected the units for ventilating and heating. Heating in the postoffice is accomplished in the mail handling areas and from the 4th to the 12th floors in the office spaces through the application of steam coils in the ventilating systems. Condensate from the steam coils is used for hot water heating of perimeter areas on the first three floors of the office building. This system ventilates the first three levels where considerable traffic moves in and out at all times. Filters in the ventilating units are cleaned with high pressure steam and detergents.

Members making the trip were then shown the air conditioning unit used for the Postmaster's and executive's suite. This unit was built up entirely by the engineering staff of the postoffice from equipment supplied to them from other postoffices such as in Indianapolis, etc. Kelly and his assistant engineer installed and tested and are now operating this air conditioning system. Thus far the balance of the postoffice has only three other zones where air-cooling is employed. It was noted during the tour that several additional zones have systems being installed.

Evaporative condensers for these units were inspected and were the source of much comment. When Kelly and his assistant first applied to NAPRE for membership they had been operating these condensers in accordance with the manufacturer's instructions and the suggestions of his field representative. The equipment had become scaled up to such an extent that it was severely handicapped in its operation. At that point Kelly was introduced to NAPRE.

Helps Engineer In Trouble

NAPRE members came to his rescue and recommended chemical treatment for descaling and maintaining the surfaces of his evaporative condensers free of scale. Among the recommendations were constant blow down, a practice which had not been pointed out by the manufacturer or his field representative. These condensers are located in the fan rooms and take their air circulation from a court in the center of the postoffice structure. They discharge the air through duct work to the roof. A Baker Ice Machine with a 50-ton capacity was inspected which Kelly uses for training purposes and some water chilling applications such as drinking water. It had formerly served the concessions. Next the members inspected the heliport, the cooling towers for the concessions, penthouses, and exhaust fans. The latter run continuously to eliminate the smoke and fumes from the track level. The Chicago postoffice is built on air rights over the Union Station trackage. Part of the Government's agreement for these rights is to furnish exhaust measures. At the conclusion of the tour members saw the operations of the mail service; storing and repairing of mail bags, the elaborate conveyor systems and general movement of mail through the Chicago gateway.

George Bright Chapter Slates 1957-58 Program

DETROIT—President Leonard Bedard, George Bright Chapter, NAPRE, announced in September the arrangements had been completed with the teachers of the Board of Education for the use of the same class room as last year at the Wilbur Wright High School, namely Room 112. The dates reserved are all on the 2nd Thursday of the month. Better parking facilities were also available, according to the announcement by Bedard.

The fourth Thursday of each month was chosen for the general meeting nights, except that the November meeting will be eliminated due to the probable absence of a large number of members attending the national convention in Chicago.

This arrangement of a school night on the second Thursday and a general meeting night on the fourth Thursday of the month has helped Detroit chapter build itself into one of the fastest growing NAPRE units in the country. It is for this reason that the 1957-58 program was continued in the same successful pattern.

Two Members Pass On

This Michigan chapter opened its Fall meeting on a sad note when it was reported that two members had passed away during the summer recess. Culver A. Purdy passed away of a heart attack on August 28 and Emmett Thomas died three weeks after an explosion in his plant, Bendix Corporation.

George B. Bright Chapter Program 1957-58 Season, Detroit, Michigan

December 12	Defrosting Methods Kramer Trenton Co.
December 19	Christmas Party—Chrystal Crown Ball Room Norman Garant, Chairman
January 9	Compressor Drives & Operating Boyd Kitts, Stroh Brewing Corporation
January 23	Topic to be Announced As arranged by Roy T. Burns, National Vice President
February 13	Servicing Chas. Heemstra, Commercial Refrigeration
February 27	Safety To be Assigned
March 13	Refrigerated Enclosures—Insulation Loran Stoops, Stoops Insulation
March 27	Questions and Answers Roy Burns and Leo Gage, City Inspectors
April 10	Instruments & Meters H. O. Trerice, and Taylor Instrument Co.
April 24	Plant Trip to Sun Oil Co. Refinery at River Rouge
May 8	Heat Calculations—Humidity in Refrigeration Boyd Kitts
May 22	Air Conditioning Chas. Rouse, Eastland Center
June 12	Compressor Calculations E. P. Callanan, Detroit Ice Machine Co.
June 26	Ladies Night Refrigeration, Air Conditioning & Electrical Appliances Kelvinator and Frigidaire Representatives

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Marsh gas or methane, as it might be called, emitted from sunken wells on Bendix Company Research Laboratory premises in a suburb of Detroit, was the cause. This gas was ignited by a flash or spark from the automatic pumps in the pump house. Thomas happened to be in the pump house when the explosion occurred and was severely burned.

The explosion burned out one end of the building.—L.L.ADAMS.

McKee Previews Ogden Plant Convention Talk

LOS ANGELES—Over one-third the entire membership of California Chapter No. 2 turned out on September 18 to hear Robert F. McKee, San Francisco, mechanical engineer for Pacific Fruit Express Co., present an illustrated talk on his firm's new ice plant in Ogden, Utah. McKee subsequently delivered a technical paper on this plant at the 1957 NAPRE national meeting, Chicago, November 18-21, following which the paper will be published in INDUSTRIAL REFRIGERATION. At the September meeting of Los Angeles Chapter, which was held at the Terminal Club, McKee first showed a series of Kodachrome films taken by himself and Ed. L. Nelson of the Union Ice Company, Los Angeles. Commentary on each view of the exterior and interior of the plant was given by McKee as the film unreeled.

The Ogden plant of PFE, which has been referred to as "the world's most fabulous ice plant", is equipped with four centrifugal compressors, each with a capacity of 285 tons. They are three-stage 450 hp units operated at 8750 rpm, and using Refrigerant-12. To give some idea of the unusual features incorporated in the new plant, McKee commented that the engine room is radiant heated. The plant was designed with the idea of eliminating as much maintenance as possible, and how this was accomplished, and the details of its machinery and its fully automatic push-button controls, its 3-cell cooling tower, and other technical details, will be described fully by McKee in his appearance before the national convention.

Ham-n-Beans Feed

Since the September meeting is featured annually as the Ham-and-Beans, or get-away meeting, the program for September 18 included a social period at which Ernest C. Hammersmith of the PFE played the role of waiter in serving up the canapes and relishes that accompanied more liquid refreshments. This part of the program was enlivened by the presence of a petite accordian player who brought song from the souls of NAPRE members where none had been known to exist before. The "song", to be sure, consisted largely of barbershop quartetting in which volume far exceeded harmony and melody, but no one seemed to notice or care about the occasional false note that was struck.

Ham-and-beans was served in the Terminal Club dining room during which time Chapter President Victor A. Stubblefield introduced local and out-of-town guests. Among these was Leroy Etzel of San Francisco, the 1956 National NAPRE President, who is general supervisor of refrigeration for Pacific Fruit Express Co., who had come to Los Angeles to hear his engineer, Bob McKee, talk on the company's new Ogden plant. Also introduced was Noel Montagnon of Ottawa, Canada, now employed by the Missles Division of the Bendix Co., Los Angeles.

Stubblefield to Bakersfield

Chapter President Stubblefield took the members by surprise by announcing that he found it necessary to resign. He had been promoted from assistant plant manager, Los Angeles, to plant manager in Bakersfield, Calif., for PFE, and would find it impossible to conduct the chapter duties as president. He turned the gavel over to first vice-president Mike Julius, Union Ice Co., who will serve as chief executive of the chapter until the annual election in December.

Program Diversification

Members of Los Angeles Chapter have indicated that more emphasis should be placed on other refrigerants, in both the preliminary classes and in subjects handled by speakers at the monthly meetings. In addition to central station air conditioning and industrial applications using a variety of new refrigerants, more new members work for firm's using mechanically refrigerated railroad cars. An effort is being made to have the subject given more emphasis when the program of speakers for 1958 and the curriculum of subjects for the preliminary classes is set up shortly after the first of the year. Los Angeles chapter officers, and members attached to the educational committee, which includes such well known figures as Frank G. Muzzy, Lawrence H. Benedict, Regis Gubser, Guy R. King, R. L. Maple, H. N. Royden, Robert H. Savage and David R. Nurse, are men who keep their ears tuned to the trends and wishes of the membership. It is thought probable that the request for more emphasis on the study of all refrigerants will be given careful consideration.

—FRED HERR

Distinguished Visitors At Greater Kansas City

KANSAS CITY—First meeting of the Greater Kansas City Chapter, NAPRE, was a business and social affair held on September 7 at the Federal Cold Storage Company. Among the distinguished visitors attending this first meeting was Charles J. Gregory, president, Southeastern Public Service Company and the Railways Ice & Service Company. Glenn Jackson, vice-president, Railways Ice & Service Company.

Maintenance was the principal topic of the October 1 meeting of the chapter. Henry Small, chief engineer of Hallmark Cards, Inc., discussed maintenance procedures and specific maintenance problems.

Book Review

ELECTRICAL TESTING AND TROUBLESHOOTING, published by Industrial Press, New York 13, N. Y. Illustrated. 191 Pages. Price $4.00. For sale by Nickerson & Collins Co., or National Association of Practical Refrigerating Engineers, Chicago 44, Ill.

Electrical Testing and Troubleshooting is recommended supplementary reading to "A Motor Control Is Simple As Its Components", by the NAPRE Educational Committee, October 1957 issue of INDUSTRIAL REFRIGERATION. The NAPRE paper dealt with synchronous motor controls on refrigeration compressors. Chapter 12 of *Electrical Testing and Troubleshooting* deals with trouble shooting on synchronous machines. Further, the book deals with trouble shooting on polyphase induction motors and d.c. machines as well. It also includes chapters on electrical symbols and drawings; analyzing and charting controller operation; troubleshooting test equipment; insulation testing; locating grounds; electromagnet windings; single-phase transformers; phase sequence; polyphase transformers; power cable faults and bearing lubrication. Author of the book is Philip T. Green, Industrial Training Coordinator, Panama Canal Co., Balboa, C.Z.

MATERIALS HANDLING EQUIPMENT By D. Oliphant Haynes, Consulting industrial engineer. Published by Chilton Company, Philadelphia, Pa. 636 pages. Illustrated. Price $17.50. For sale by Nickerson & Collins Co., Chicago.

This book is a graphic presentation of materials handling equipment, well illustrated and with a complete index, making it handy as a reference guide. It is designed to show specifically how each machine functions and what it actually does. More than 2200 line drawings are used to illustrate the basic "Why" of materials handling machines. The information on this equipment is of vital importance to the salesman and top management as well as the operators. A special point is made that in today's business world materials handling is one of the spots where competitive economies can be effected, one of the few present means left to warehouses and others handling a large volume of commodities. The author, Mr. Haynes for some years has been a consulting engineer, specializing in materials handling. Some years ago a number of his articles on this subject were published in *Ice and Refrigeration*, predecessor of *Industrial Refrigeration*.

ASRE Opened Industry Activities Centered Around Chicago Show

PRECEDING the 10th Exposition of the Air Conditioning and Refrigeration Industry, The American Society of Refrigerating Engineers held its 44th semi-annual meeting at the Shoreland Hotel, Chicago, November 14 through 16. ASRE was the lead-off group for several national meetings planned coincidentally with the ARI Show. The meeting opened with a welcome luncheon at noon on Thursday, November 14. Featured speaker at the Luncheon was Alvin J. Blake, President, Chicago Technical Societies Council. Blake, who is the staff chief engineer for the Farm Tractor Division of International Harvester Corp., delivered a three-part address on the professional person's responsibility to his business and profession, to himself, and to his community.

The 3-day program included three technical sessions, four conferences and numerous committee meetings. Papers presented at the technical sessions included the following topics:

Design-Engineering of B-47 Air Cycle Air Conditioning by G. E. Gregg of Boeing Airplane Co.; Greenhouse Climate Control by R. S. Ash of International Metal Products Co.; Removal of Ice Film by S. G. Eskin of Dole Valve Co. and W. E. Fontaine and O. W. Witzell of Purdue University; Simple Moisture Indicating Device for Refrigerating Systems by W. O. Krause and A. B. Guise of Ansul Chemical Co.; and Thermal Conductivity Apparatus for Operation Near Room Temperature delivered by Edw. Simons, for T. Gier, R. V. Dunkle and J. T. Bevans of the University of California.

Other topics: Hermetic Motor Speed Indicator by W. W. Sutherland, Westinghouse Electric Corp.; Permeability of Plastics Films to Refrigerant-12 and Nitrogen by H. M. Parmelee of E. I. duPont deNemours & Co. Inc.; and Influences of Insulation on Moisture-Condensation Aspects of a Steel-Framed Cold-Storage Warehouse Structure by C. F. Kayan and R. G. Gates of Columbia University.

Application Conferences

The four conferences dealt with the following topics:

Problems of Aluminum Usage in Refrigerator Systems, R. S. Buchanan of Westinghouse Electric Corp., presiding; Refrigeration in Meat Packing and Related Industries, with H. A. Stevens of Swift & Co.; Central Plant Air Conditioning for Multi-Room Buildings, W. L. McGrath, Carrier Corp., presiding; and Food Preservation with H. C. Diehl, TRRF.

Among the topics handled by the Meat Preservation Conference were:

Immersion Freezing of Poultry, E. L. Hulland, Swift & Co.; Economics of Coils vs. Fan or Blower Units for Meat Packing Plants in 0°F Combination Freeze and Hold Rooms, B. C. McKenna, City Products Co.; Liquid Ammonia Recirculation Application in Meat Packing Plants, W. C. Mathews, Armour and Company; Beef Carcass Chilling and Holding, Roland Retrum, Rath Packing Company; and Packaged Quick Freezing Equipment, F. P. Neff, The Tupman-Thurlow Co.

The Air Conditioning Conference also presented a number of topics, among them: Systems for the Air Conditioning of Multi-room Buildings—Their Description and Performance

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Characteristics; The Economics of Air Conditioning in Large Buildings—Economic Benefits to the Owner and Economic Comparisons of Systems and Methods; Installation Problems and Experiences in the Air Conditioning of Multi-Room Buildings; and Refrigeration Plants for the Air Conditioning of Large Buildings—A Comparison of Types Available, Relative Performance and Criteria of Selection.

The Present and Future Outlook for Food Preservation; Chairman, Dr. H. C. Diehl, Director and Secretary, The Refrigeration Research Foundation. Speakers on the panel were Dr. D. K. Tressler, Technical Dir., USQMC Food and Container Institute for the Armed Forces; Dr. W. M. Urbain, Assoc. Dir. of Research, Swift & Company; Dr. M. J. Copley, Dir., Western Research and Development Div., Agric. Research Administration, USDA; Dr. L. E. Clifcorn, Supv., Container Utilization, American Can Company; W. T. Pentzer, Chief, Biological Sciences Div., Agric. Marketing Administration.

Feature inspection trip for the ASRE meeting was a trip to the Argonne National Laboratories at Lemont, Illinois. The trip proved popular enough that it had to be staged over a 2-day period, Wednesday, November 13 and Friday, November 15. The Argonne National Laboratories is scene of the earliest developments of atomic energy and the location of the first 5000 KW experimental boiling water reactor. The laboratory is operated by the University of Chicago for the U. S. Atomic Energy Commission.

Informal Discussions

The forums, a more informal floor participation type of program, included the following persons who led discussions on specific topics: S. Charles Segal, Vice-Chairman, General Sales Manager, Kramer Trenton Co., in charge; Refrigeration in Candy Manufacture, Dr. J. G. Woodroof, Georgia Experimental Station; Automatic Operation of Refrigeration Plants, Don A. Parkhurst, President, Burge Ice Machine Co.; What ASRE Can Do to Interest Industry in Education, Prof. M. K. Fahnestock, University of Illinois; The Problem of Correct Installation of Residential Air Conditioning, H. T. Gilkey, Technical Secretary-Research, Warm Air, Heating and Air Conditioning Association; Compression Ratio and Discharge Temperature Limits, M. W. Garland, Chief Engineer, Frick Company; Small Truck Refrigeration Equipment, H. G. Strong, Executive Secretary, Refrigeration Industrial Safety Advisory Committee.

News of PEOPLE

Appel Appointed to National Planning Council

VALLEE G. APPEL, President of the Fulton Market Cold Storage Company of Chicago, has been named to membership on the National Council of the National Planning Association.

The Council is a group of leaders in agriculture, business, labor and the professions, representative of all geographic areas in the country. Membership is limited to 1,000.

The purpose of the National Council is to encourage cooperation by the major private groups, and to promote wider public consideration of the long-term planning studies undertaken by NPA and other organizations.

The National Planning Association is a private, nonprofit, nonpolitical association founded in 1934. It operates through Standing Committees of leaders—of agriculture, business, labor and the professions, conducting research in economics and on questions of national policy. All published reports are made available to the public. The Association's activities are financed by membership contributions and foundation grants.

GUY W. JACOBS, recently retired from the position of Secretary of the National Association of Ice Industries, became Chairman of the Board of The Union Savings Bank and Trust Co., Steubenville and Toronto, Ohio, on November 1. Mr. Jacobs has been residing in Washington, D. C., but will return with his family to Steubenville soon.

JERRY P. JOHNSON, former president of the National Association of Refrigerated Warehouses, and a veteran in the cold storage business, left his position as sales coordinator for the Merchants Refrigerating Co. to live permanently in Santa Barbara, Calif.

KENNETH L. CHAPPELL has assumed the management of the Germantown Cold Storage Co., Inc., New York, and becomes its secretary and treasurer. Mr. Chappell had been assistant to the late W. M. Rider for the past 30 years.

WM. G. MEDLAR has been elected Vice-president of the Fulton Market Cold Storage Co., Chicago. Mr. Medlar, formerly of Cleveland, has been identified with the refrigerated warehousing business for the past 25 years.

DEATHS

EUGENE J. HEINZMAN, 76, manager of the Artificial Ice Company, Ann Arbor, Michigan, died September 24, 1957. He had been ill for some time.

Mr. Heinzman had been associated with the Artificial Ice Company since it was organized in 1909, and had been general manager since 1913. He also was the Company's Vice-President and Treasurer. He was an active member of the Michigan Ice Industries Association and the National Association of Ice Industries and for several years served as a Director in the Michigan Association.

C. FREDERICK ELDRIDGE, 63, died at his home in Auburn, New York, October 6, 1957. Succeeding his father, who died January 15, 1928, he owned and operated the Eldridge Coal and Ice Company in Auburn until his retirement 3 years ago. He had been active in the Central New York Ice Association, Eastern States Ice Association, National Association of Ice Industries and New York State Retail Coal Merchants Association.

HOWARD R. KAHLER, 67, Coral Gables, Florida, who retired as southern district manager for City Products in 1954, died October 17. He came to the Miami area in 1927 and became manager of the ice department of Florida Power and Light Co. Later, the business was sold to City Products. Mr. Kahler was an honorary life member of the Florida Ice Association.

OSCAR WILLIAM DEYERLE, a native of Upper East Tennessee, died recently at his home in Atlanta, Ga.

Mr. Deyerle was a retired Atlantic Ice & Coal Co. executive. He assisted in organizing the company and was vice president and chief engineer for 15 years. He retired a few years ago. He had lived in Atlanta for 45 years. Previously he was associated with the Fred W. Wolfe Co. of Chicago.

BRADFORD O. BROWDER, 53, Kingstree, So. Car. died on October 2, following a heart attack. He was manager of the Southern Cities Ice Co. in Kingstree as well as managing the company's plants in Lake City, Timmonsville, Manning, Summerton and Hemingway. He was a director of the South Carolina Ice Manufacturers Assn.

Fire Destroys Cold Storage Plant in Northwest

FIRE in the Western Cold Storage plant at Moss Lake, Washington on October 23, destroyed the plant and contents with a loss estimated at $500,000. Only the walls remained standing following the fire.

"The insurance on the building will not begin to cover the replacement value of the $240,000 building," Fred W. Mattson, secretary-treasurer of the company, said. "It's too early to tell but there is a possibility that we might try to rebuild," Mattson said. The building also included an ice plant and 350 food lockers.

Businesses were closed and evacuated as far away as a block from the burning building. Firemen were finally able to release a little of the 150-pound pressure on the ammonia tanks. Firefighters worked to sandbag the basement and completely flood it with water in an attempt to keep the ammonia tanks from exploding.

Adams Co. is New Name For Colorado Ice & C.S. Co.

ADAMS Co. is the new name for the firm which will hold non-operating assets formerly owned by Colorado Ice & Cold Storage Co., Denver, stockholders voted recently. As reported in the November issue, Colorado Ice's operating assets and the firm name were sold recently to Southeastern Public Service Co. of New York.

Fred M. Adams continues as president of Adams Co., which holds a substantial interest in Carlson-Frink Co. and owns certain real estate, bonds and notes.

COMING CONVENTIONS

1958 FACT FINDING CONFERENCE
February 14-15-16
Municipal Auditorium
Kansas City, Missouri

THE REFRIGERATION RESEARCH FOUNDATION
March 6-8, 1958
Adolphus Hotel, Dallas, Texas
H. C. Diehl, Director

AMERICAN WAREHOUSEMEN'S ASSOCIATION
March 10-13, 1958
Adolphus Hotel, Dallas, Texas
Wm. Dalton, Secretary

NATIONAL ASSOCIATION REFRIGERATED WAREHOUSES
March 10-13, 1958
Adolphus Hotel, Dallas, Texas
Wm. Dalton, Executive Vice-Pres.

NORTH CAROLINA ICE ASSOCIATION, INC.
March 9, 10, 11, 1958
Sir Walter Hotel, Raleigh, N. C.
Lewis H. Powell, Secy-Treas.

AMERICAN POWER CONFERENCE
March 26-28, 1958
Hotel Sherman, Chicago, Ill.
R. A. Budenholzer, Conference Director
3300 Federal St., Chicago 16, Ill.

CANADIAN WAREHOUSEMEN'S ASSOCIATION
May 12-15, 1958
Seigniory Club, Montebello, Quebec
H. Cecil Rhodes, Managing Director

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Food Preservation
Operating
Servicing
Refrigerated Enclosures
Instruments and Meters
Heat Calculations
Humidity in Refrigeration
Compressor Calculations I
Compressor Calculations II
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MANUFACTURERS' NEWS

Carrier Builds 4,000th Centrifugal Refrigerating Unit

THE device which 35 years ago made air conditioning of large buildings practical has passed a new milestone with the shipment of its 4,000th giant successor made by Carrier Corporation. The centrifugal machine when developed by the company in 1922 was the first completely compact cooling unit for air conditioning. Its creation was responsible for much of the growth of the now $3-1/2 billion air conditioning industry.

The 4000th Carrier Centrifugal is christened with Refrigerant.

The 4000th machine was christened by the 16-year-old daughter of the development engineer Adolph Zulinke who worked closely with Willis H. Carrier in designing the prototype. Also attending the ceremony was the retired superintendent of centrifugal production Louis J. Harris who as a young employee helped build the first model.

Only a few miles away, at Onondaga Pottery Company, Syracuse, N. Y., the original unit is still in good operating condition.

Noting the improvements made in 35 years, Charles V. Fenn, Carrier vice president said the 4,000th machine, while not quite twice the size of the first one is about 14 times as powerful.

It will be one of two, each providing 1,000 tons of cooling for complete air conditioning of the 208 South LaSalle Street Building in Chicago.

Although the 4,000th is one of the larger centrifugals manufactured, it is by no means the biggest, the Carrier executive said. "Today, the range is from a nominal 100 tons up to 3,000. And the trend is toward larger-size machines to handle the bigger air conditioning requirements imposed by improved lighting and all-glass buildings while holding cost and space requirements to a minimum." Although most machines deliver chilled water for air conditioning at temperatures in the range of 45 to 55 degrees, many have been applied to process refrigeration and have provided cooling levels as low as 186 degrees below zero.

At the christening ceremony 16-year-old Caroline Zulinke, daughter of Adolph Zulinke, senior project engineer for centrifugal machines, sprayed the unit with refrigerant gas, which vaporized as it left the flask.

She was aided by 8-year-old Pamela Colway, granddaughter of Louis J. Harris, who helped build the first unit, and who retired as superintendent of centrifugal production.

Refrigerating Specialties Appoints Indiana Distributor

REFRIGERATING Specialties Company, Chicago manufacturer of refrigeration control valves and regulators, announces the appointment of Barton Distributing Company of Indianapolis, Indiana as distributor for their products in the state of Indiana.

"One Price" Policy on Freon Refrigerants

DU PONT'S "Freon" Products Division will institute a "one price" policy on all of its "Freon" refrigerants, aerosol propellents, and solvents, effective December 26, in a move to help its customers reduce distribution costs to the lowest possible level.

The change means that any particular type of "Freon" compound will be sold at one uniform price schedule, regardless of the end use of the chemical. In the refrigeration field, it eliminates the current policy of separate pricing of individual "Freon" refrigerants, depending upon whether they are sold to equipment manufacturers for original equipment charge or to the wholesale trade for resale to servicemen and contractors for replacement charges in existing equipment. Price differentials according to container size, of course, will be maintained.

At the same time, the company's "Freon" Products Division announced that the Ansul Chemical Company of Marinette, Wis., and the Virginia Smelting Company of Norfolk, Va., have been named sales agents for "Freon" refrigerants to the wholesale level. Effective December 26, all sales of "Freon" to wholesale outlets will be made through those two agents, the company said, although billing, credit handling and customer selection will remain the responsibility of the Du Pont Company. In addition, sales of "Freon" through existing national distributors will be discontinued on that date.

Under the revised system, explained Joseph C. Hoopes, manager of field distribution for the "Freon" Products Division, Du Pont sales representatives who formerly contacted refrigeration wholesalers will assume additional responsibilities in "coordination and sales promotional activities, assisting Du Pont sales agents and wholesalers in achieving sales goals." Sales representatives of the division, however, will continue to handle direct sales to refrigeration equipment manufacturers, aerosol loaders, and specialty accounts.

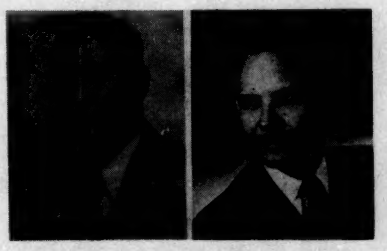
York Promotions

SEVERAL personnel changes in the York Corp., subsidiary of Borg-Warner were announced by Austin Rising, vice-president and director of marketing.

M. S. Lebair has been named Assistant Vice-President for Marketing and in this position, Mr. Lebair will act as staff assistant to Mr. Rising in all areas of the marketing program, with specific emphasis upon trade relations.

Mr. Lebair began his career with York in 1917 as a draftsman and later moved into the sales field and was subsequently appointed Sales Manager of York's Philadelphia office. He later became Branch Manager in Philadelphia and in 1936 was made Manager of the Middle Atlantic District, supervising York Corporation activities in the area comprised of eastern Pennsylvania, Maryland, Delaware, Virginia, southern New Jersey, and the District of Columbia.

M. S. Lebair *Robert G. Werden*



Robert E. Cassatt *Walter L. Pharo*

Robert G. Werden is now General Sales Manager of Engineered Equipment, and will direct the sale of all engineered York air conditioning and refrigeration equipment in this country, with headquarters at York, Pa. He has been with the York Corporation for 20 years, serving as a sales engineer, sales

manager of the Middle Atlantic District, and manager of the North Atlantic District.

Robert E. Cassatt has been named General Sales Manager of Packaged Products. In his new position, he will supervise the sale of York room air conditioners, residential heating and cooling equipment, packaged ice-making units, refrigeration products, and commercial self-contained air conditioners throughout the United States.

Walter L. Pharo has been named General Sales Manager of Contract Products and in his new assignment will be responsible for all sales activities of this new division, involving a number of special products not directly related to the air conditioning and refrigeration industry.

Fuller Now Armour Ammonia District Sales Manager

A REALIGNMENT of eastern sales personnel has been announced by the Ammonia Division of Armour and Company.

Carl J. Fuller has been appointed district sales supervisor with headquarters at Lodi, N. J.

Mr. Fuller has been with the Armour Ammonia Division since 1929 except for three years in military service. In his new assignment he will be responsible for sales in the New England and Middle Atlantic states.

Carl J. Fuller

William O. Passmore has been appointed ammonia sales representative in the southeastern New York and northern New Jersey areas, succeeding Mr. Fuller. Mr. Passmore previously handled northern New York area sales.

Peter L. Koehler has been named to succeed Mr. Passmore as northern New York ammonia sales representative.

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Classified Advertising

All classified advertisements are payable in advance. Except for Positions and Help Wanted classifications, this section is reserved exclusively for USED equipment.

RATES: 20c per word; minimum 25 words. $2.00 per line for bold face headings: $15.00 per inch for line listings.

USED EQUIPMENT—wanted & for sale

NAME PLATES—Engraved, plastic, weatherproof name plates for identification of valves and switches, control panels, etc. Black and white engraved characters. Send for price list and sample. Southern Name Plate, P.O. Box 1461, New Orleans 5, La.

FOR SALE — Refrigeration equipment; ice equipment; new, used. Advise us your needs. Use "QUICKSEAL" — stops brine tank leaks; easy, efficient, economical. Born Company, 80 East Jackson Boulevard, Chicago 4, Illinois. WAbash 2-3299

FOR SALE—Three Carrier 30B4 Freon-12 chiller units; approximately 18 months in service. Two units equipped with 100 h.p. 440/3/60 motors, direct connected, nominally rated at 100 ton air conditioning. One unit equipped with 75 h.p., 440/3/60 motor, direct connected, possible capacity of 40 ton refrigeration at 0° F and 9.2# suction. All three units complete with gauge board and controls, including starters. Presently dismantled and ready for loading. Complete lot of equipment f.o.b. storage site at Green Bay, Wisc. $16,-200.00. Write or phone Gartner Refrigeration & Mfg. Inc., 2913 Lyndale Ave., South, Minneapolis 8, Minn. Phone TA 7-3533.

PERFORMANCE PROVED — New Ball Valve increases the performance of any compressor — old or new. See the Ball Valve ad on Page 8 of this issue.

FOR SALE—One Battle Creek Package Machine Company high speed wrapping machine. Model 51-3, with electric eye paper control, BiJur lubricating system, extra paper holder for quick change. 220 volts, 60 cycle, 3 phase. Machine purchased new direct from Battle Creek in September 1953; used only on short seasonal deals. Can be inspected at our plant. Mid-South Refrigerated Warehouse Company, 1100 East Parkway South, Memphis, Tenn. Phone FA 7-1611.

FOR SALE—AMMONIA

4—10"x10" 4-cyl. York duplex D. C. to 225 h.p. motor.
2—10"x10" 2-cyl. York D.C. to 100 h.p. motor.
1—9"x9" 2-cyl. York D. C. to 75 h.p. motor.
4—9"x9" 2 cyl. Frick compressors.
1—7¾"x5" Frick booster.
2—7½"x7½" 2-cyl. York compressors.
1—5¼"x4¼" 6cyl. V/W York booster compressor.
1—5"x5" 2-cyl. York compressor.
1—3"x3", 1—4"x4", 2—5"x5 condensing units.
11"x22"x47"—11"x22"x51 ice cans.
From 20 to 100 ton ice plants, York & Frick.
ENTERPRISE EQUIPMENT CORPORATION
79 Alexander St. Box 502 Yonkers, N. Y.
Cable "ENEQCO" Phone Yonkers 8-8118-9

FOR SALE — 9x9 Frick (factory rebuilt 1956); D.C. motor (rewired 1956); new Westinghouse starter switch & good AC-DC set. A real buy! Priced right. Media Fuel & Supply Co., 523 South Ave., Media, Penna. LOwell 6-0570.

FOR SALE — 25 ton York ice tank, four can groups — 78 groups; 300 pound cans, size 11" x 22" x 52". All related equipment consisting of agitator, blower, core pump, can filler and dip tank. Also Shepard Niles 2000 pound crane, Miller scoring machine and ice crusher. All above in A-1 condition. Write Box DC-2, % Industrial Refrigeration.

FOR SALE — 5x5 and 8x8 York compressors. 20" receiver. 3 ton ammonia blower unit, suspended type. Valves up to 2", one-half price. Write E. Niebling, 1546 St. Clair Ave., Mount Healthy, Cincinnati 31, Ohio.

FOR SALE

10x10 York Model D8 125 h.p.
9x9 York duplex model D8 360 r.p.m., 200 h.p.
10x7½ & 8x6 York Model D8 boosters.
7½x7½ York w/V-belt drive to 50 h.p. motor.
300 h.p. Westinghouse starter 4160 volts (NEW)
100 h.p. 1200 r.p.m. GE motor w/starter.
Condensers, receivers, motors, etc.
15x10 air compressor 50 h.p.
(3) 38"x17' York shell & tube condensers.

JOHN F. CARSON
A & Venango Sts. Philadephia 34, Pa.
GArfield 6-2221

ICE PLANTS—wanted & for sale

FOR SALE—20 ton ice plant complete. Now in operation. For details write P.O. Box 555, Lonoke, Arkansas.

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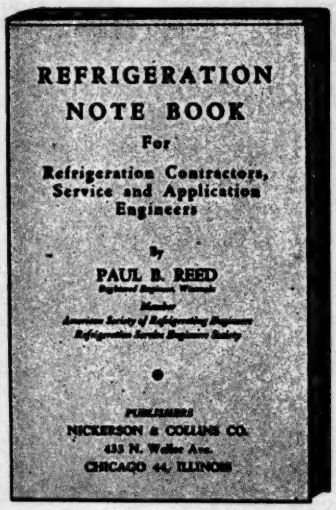

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